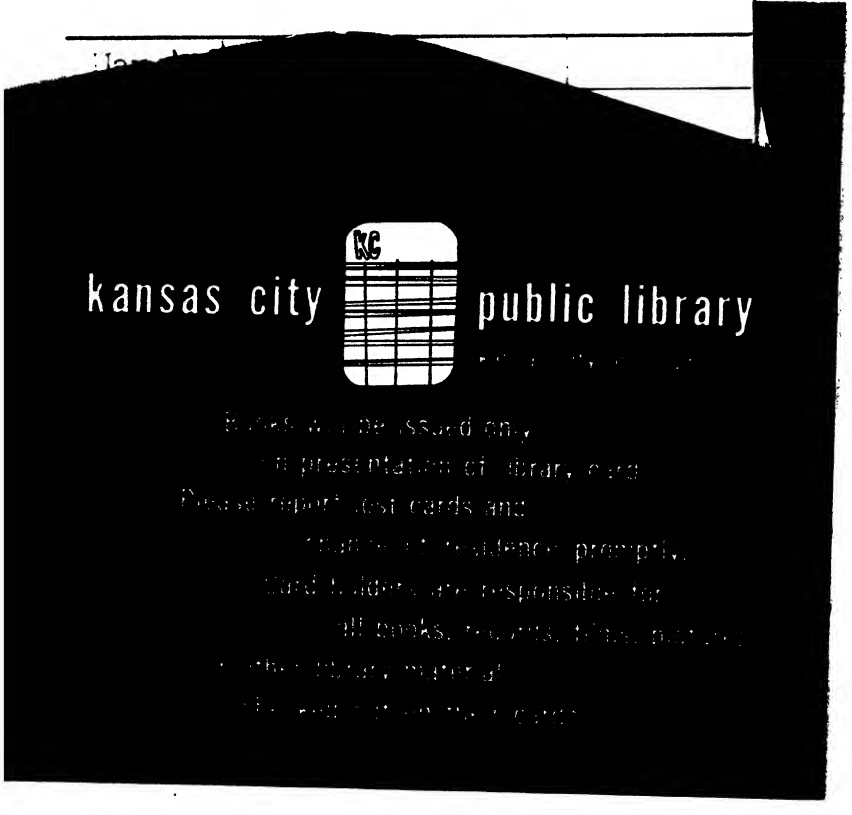

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THE TECHNIQUE OF OIL PAINTING

Courtesy Midtown Galleries

FREDERIC TAUBES

SETTING THE TABLE

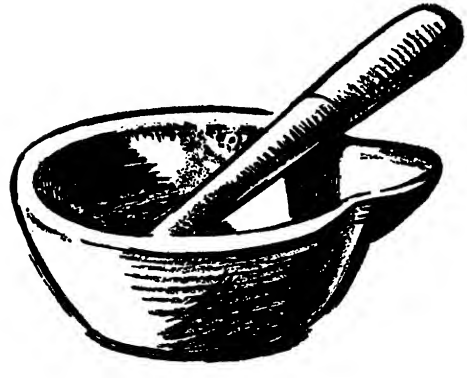
THE TECHNIQUE OF OIL PAINTING

A DISCUSSION OF TRADITIONAL OIL TECHNIQUES FOR USE BY THE CONTEMPORARY PAINTER

By

FREDERIC TAUBES

With Frontispiece in Color and Sixteen Black and White Plates



DODD, MEAD & COMPANY
NEW YORK 1941

PRINTED IN THE UNITED STATES OF AMERICA
BY THE VAIL-BALLOU PRESS, INC., BINGHAMTON, N. Y.

TO

MY WIFE

In spite of a voluminous literature on the subject of oil painting, the matter has not yet been exhausted, nor even a definite clarity established.

The task undertaken in this handbook is to simplify and organize a vast material and to avoid confusion created by compilation of impractical references and information. The author refrains from resorting to erudite quotations from often vulnerable predecessors and scholarly explorers. The material in the following pages has been gathered during a life time of practise in oil painting. References to chemistry, history, etc., have been greatly reduced and an ocean of complex, dubious and impractical methods and materials omitted, to make this book readable.

The author believes, however, that no essential information has been neglected. He is conscious of the fact that modern chemistry has produced many new materials which have proven in laboratory tests to be equal or even superior to the materials of the ancients, but being a painter and not a chemist, he could not possibly test and varify all of these innovations. However, he recommends all those new materials with which he could thoroughly familiarize himself. The author hopes that this book will aid the painter and make some contribution toward a real understanding of the technique of oil painting.

FREDERIC TAUBES

New York, 1940.

Observations on the Controversy over the Technique of the Old Masters

Many an authority and semi-authority has filled a good-sized library with learned treatises on the "secret" of the old masters. The hunt for this elusive key has usually been either a fanatic or romantic quest, depending upon the temperament of the explorer. Generally it has been a futile one. What could such a secret reveal? It can hardly relate to the amount of artistry or coloristic beauty with which those paintings were endowed, since our contemporary means enable us to achieve equal brilliance and coloristic splendor. The secret, then, must refer to the technique and permanence of their work. But the old masters, as we term them, were scattered over a period of four centuries, and different methods were employed by them at various times. Therefore, any reference to a secret method by which the old masters achieved permanence can have no meaning.

The idea that the ancients were engaged in a kind of conspiracy to keep their methods secret, or that such methods have been lost to posterity, is a myth prevailing mostly in the minds of deluded scholars. It is useless and futile to quote here the fantastic deductions of some theorists, the alchemistic formulae and other varieties of industriously accumulated confusion. The truth is that the permanence of the old masters' paintings is not universally character-

istic, but exists conditionally, and only to a certain extent. A visit through the museums will reveal many ruins manifest on the walls. A search through the archives of museums and the records of feudal patrons will reveal that many a brilliant painting has been restored and re-restored. Bills presented by various restorers at various times, and still to be found in the archives, eloquently proclaim the fact.

An investigation of well preserved paintings of antiquity produced prior to the general use of oil as a painting medium, which developed at the end of the fifteenth century, demonstrates the permanence of the oldest of painting methods, namely that of the tempera technique. This method as practised by the painters of the tempera school employed pigments mostly identical with those used in oil painting, and their work did survive. It is obvious, then, that the prime reason for deterioration of paintings must be ascribed principally to the binding medium used for the pigments.

Equally well preserved were oil paintings developed first in *grisaille* (variations of greys, also called monotones) or *camaïeu* (the use of two tones. See page 54.) The actual chromatic effect was achieved by oil color glazing, mostly, however, by resin-oil color glazing. Only to the use of this method can be ascribed the depth, clarity, luminosity and excellent state of preservation of these early paintings.

The oil color used in the mentioned technique has the best chance to remain stable due to the *luminous underpainting which counteracts its darkening*. The oil color becomes more transparent,

losing its opacity as centuries pass, especially the thinner applications of pigments, and the painting sometimes becomes even lighter in appearance, due to the "light from within."

With few exceptions, the ground upon which the painting was executed was perfectly white, and consisted of as many as seven coats of priming to insure the painting against later darkening. (Such a ground must be necessarily thick and can be applied only on a rigid support.) One does not need to scrape the surface to the ground to prove it. The feeling of *luminosity from within* is obvious. On the other hand, various deteriorations are most frequently caused by painting on dark grounds without a strong light underpainting. Unsuitable oils and heavy oil varnishes profusely used will also effect a considerable darkening, yellowing or cracking. Also, the application of many coats of oil paint, one on top of another, will cause deterioration.

Another point to consider is that on richly textured canvases, especially when not properly varnished, dirt easily penetrates into the crevices and incorporates with the pigment. In these cases the darkened appearance of a painting cannot be restored. Obviously, smooth surface and enamel-like finish offer greater resistance to the accumulation of dirt.

A painting should, however, age, and do so gracefully. Even marble ages, and much to its advantage. Wood ages and acquires a precious glow and mellowness. A painting should age, but should not become a premature wreck. It takes at least half a century for a painting to mellow and for the colors to "grow together." Restorers who would fix up a painting several centuries old to appear

as if it had been painted only yesterday, show poor judgment and bad taste.

SOME OF THE REASONS FOR THE RETROGRESSION OF THE LATER-DAY TECHNIQUES

The education of an apprentice painter during the time of the Guilds in the middle ages, resembled somewhat the training of a mason, plumber or shoemaker. Apprenticeship was long, traditions firm, and regulations strict. The system of Guilds made a dilettante approach impossible. The materials employed were standardized and so well specified that monetary fines were imposed upon practitioners deviating from the set rules. The application of inappropriate or untested materials by the painter was a transgression equal to using inferior mortar in house building. The use of true ultramarine (lapis lazuli), for example, was regulated by contract. So the "secret" most scholars are seeking can be found in the simple use of dependable materials, and observance of their inherent properties. The pigments were of organic as well as of mineral origin and when they were chemically incompatible, all precautions were observed to apply them logically. Not all of them were, however, absolutely permanent.

With the extinction of the Guild system came the neglect of tradition. The commercialization of the color industry resulted in a lack of control over the producers of oils and pigments. This contributed to the present ruinous appearance of so many paintings which are not so far removed from our time. Today we do not employ apprentices or disciples, nevertheless, we will have to attend

to all the mechanical processes such as priming the canvas, preparation of the varnishes and grinding the pigments personally, if we respect and love the craft. But it must be stated here that our present day commercially produced materials are to a good extent up to the required standards.

Knowledge, logic and responsibility comprise the "secret." Knowledge saves us from faulty beginning. Logic should lead us toward the use of tested, reliable materials and the reasonable use of them. And responsibility will force us always to keep in mind the thought that our work "shall last forever."

The painting which remained practically unchanged since the time of the pre- and early Renaissance, was either executed in pure tempera or it carried tempera underpainting, at least in the light parts. Not before the year 1500, with the gradual disappearance of tempera methods, did the pure oil-color technique begin to assert itself. The support upon which the painting was constructed had a strong white ground, or if a dark ground was used, a light underpainting preceded the final oil painting. Heavy oil overpaintings were avoided. (Only tempera permits repeated overpainting without damage.) Compatible colors were used and all rules observed to build up a painting properly.

This is all so simple that we might go right ahead and by employing the same technique produce paintings of equal permanence. However, technique is an esthetic expression and not a term pertaining merely to mechanical methods. Esthetic and artistic reasons are the governing factors and these are again ruled by the expression, style and necessities of the epoch. The style manifested by the early Flemish painters, for example, dictated their method; or perhaps the reverse was true—the method created the style. It cannot be answered conclusively whether time influences us or we influence our time.

The technique of the pre- and early Renaissance was necessitated and limited by the mode of living, the aspect, scope and per-

ception of their time. It was the expression of their age and their esthetic sensibilities. It would be useless to us. The ancients may seem to be limited in comparison with us; but they were not limited in terms of their own esthetic needs. The van Eycks were not limited when compared to Rembrandt; but Rembrandt could not have used their method or their technique. His time and needs were different. In Titian's eyes already the tempera practitioners did not paint—they "tinted." The development of a painting on a traditional grisaille, for example (we shall describe a modified way in Chapter VIII, Underpainting) and the subsequent coloring of the grisaille does not permit one to paint freely and impulsively. There is a rigid staininess about those paintings quite contrary to our temperament and taste.

Being aware of these facts, we cannot follow the technical processes involved in the work of van Eyck or Dürer, for instance, although we could thus achieve unlimited permanence. We may, however, approximate the method of Frans Hals, for example, or Rubens, whose oil-painting technique is more congenial to our expression, and whose work, with regard to longevity, will run as "second best."

GENERAL RULES OF A PERMANENT TECHNIQUE

1. Employ reliable and tested materials.
2. Build the painting upon a white ground.
3. Underpaint in a much lighter key as compared with the final painting.
4. Underpaint with a leaner; overpaint with a fatter painting medium.
5. Use the oil medium sparingly.
6. Observe the chemical and physical properties of pigments and their compatibility.
7. Do not coat the canvas in many layers.
8. Paint on a dry ground. Leave sufficient time for the underpainting to dry.
9. Varnish the painting and do it at a proper time.
10. Do not rely too much on your own findings or clever innovations. Employ the time-honored recipes.

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THE TECHNIQUE OF OIL PAINTING

CHAPTER I

PREPARATION OF THE CANVAS

The raw canvas should by all means be prepared by the painter himself. There is no objection to the ready-made canvas as far as its quality is concerned. The present day manufacturing methods are mostly reliable, but there is no evidence of handwork upon the surface of the commercially produced canvas. The deadly monotonous grain as compared with a hand-finished canvas is decidedly detrimental to the execution of fine and variable textures. The charm of an irregularly interlaced canvas as achieved by laying the ground by hand can never be replaced by a machine-made product.

The sensation of the canvas structure will prevail through the color layers. Only a heavy impasto on a fine-grained fabric would conceal it. Instead of concealing the textural shortcomings of the canvas, one should rather utilize its beauty.

A fine painting will be indisputably finer on a hand-finished support.

(a) The Canvas

Pure unbleached linen should be used. The raw canvas must not contain any size or filler, which is sometimes added by the manufacturers to "improve" the body of a poor fabric and increase its weight. The texture of the material should be chosen according to the dimensions of the painting and the character of

the subject planned. A very knotty and grainy material might not be suitable for a portrait, yet quite pleasant for a different subject. A fine-grained canvas would not be agreeable for a work of larger dimensions, for example. Moreover it will not have the strength to carry the weight of paint and sagging and cracking will inevitably result. Generally the finer and lighter fabrics should be chosen for small-sized pictures. Since rough canvas does not permit the execution of fine details, its use is more appropriate for larger sizes. All these problems must be taken into consideration before selecting a canvas.

The material chosen should be tightly stretched on stretchers. Care should be taken to keep the stretchers at right angles and correctly aligned. This applies particularly to larger sizes where the pull of the canvas might easily bring the stretchers out of alignment. For larger dimensions (50 inches and up) heavier stretchers should be used with a supporting cross-brace. It is advisable to bevel down the inner edge of the stretcher upon which the canvas rests, to prevent its marking the material when priming or painting, since the ready-made stretchers are deficient in this respect. Another way to avoid the impressions of the stretchers is to insert a cardboard between the stretcher and the canvas.

The importance of the following operations cannot be overemphasized. The proper foundation for the painting depends entirely upon the exactitude of every phase of sizing and priming. (One shall also take into consideration that the quality of the raw canvas may contribute a great deal to the success or failure of the final preparation.)

(b) The Size

Consists of glue dissolved in water in the proportion of two ounces of glue to one quart of water.

The best quality of glue should be employed, such as that manufactured from leather waste. It comes in square sheets, is translucent and of brown color and is commonly known as hide glue. Or one may use rabbit skin glue, an excellent product from the clippings of rabbit skins (thin brown sheets), or gelatin, which is in jelled form most suitable for grounds. The glue should be soaked in water overnight. By heating it next day, it dissolves readily without being boiled. Boiling glue deprives it to a certain extent of adhesive power. It should be used when fresh, as a water-glue solution putrifies in a short time, especially in a warm atmosphere. After the addition of chalk and zinc white, it remains in good condition for a somewhat longer period.

Cover the canvas and also the outside edges nailed to the stretcher (the last to prevent fraying of the fabric) with a water-glue solution, using a flat, short bristle brush several inches wide. In case such a short bristle brush is not obtainable, the long bristles can be clipped to a length of about two inches. Only a little glue should be taken at a time to prevent the canvas from getting soaked through. The fabric, if soaked with glue, becomes easily brittle. The purpose of covering the surface is to isolate the tissue for the next layer of the ground and to bind the fuzz of its fabric. Too fuzzy canvases should be avoided, however, since the glue would then cause minute cracks on the surface. The canvas is dry as soon as the water evaporates. It is not advis-

able to accelerate the drying process of a wet canvas by exposing it to any kind of heat.

Another method of sizing the canvas is to permit the glue first to jell which will happen when the glue solution cools off. Whereupon, by means of a palette knife the jelled glue will be spread on the canvas in a very thin film. (This method is mostly used in commercially produced canvases. It clogs the pores of the tissue so thoroughly that the following layer of the priming material cannot penetrate the surface. The commercial canvas has only one ground layer, mostly oil ground, applied directly upon the sized canvas.)

Should the canvas become slack upon drying, either side parallel to the warp of the canvas should be opened and restretched (the sides parallel to the woof would not stretch as well).

(c) The Priming

The indicated quantity is sufficient for priming about 6 to 8 canvases 25" x 30".

1 quart glue-water solution
(in the proportion as used for sizing)
1 lb. powderized chalk
1 lb. powderized zinc white

Mix it well together so that there will be no lumps in the solution.

The indicated proportions are practical but they can vary slightly. An excess of the filler, however, might cause cracking of the ground.

Chalk (calcium carbonate) also known as Paris-white, Guilders' Whiting, has a very slight covering power. It constitutes the filler.

Zinc white (carbonate of zinc) is added on account of its lustrous white color. Instead of zinc white, *titanium dioxide* may be employed. This product came into use in the last decades. It has much more covering power than zinc white or white lead. The relation of pure titanium dioxide and whiting will be:

2 oz. titanium dioxide
1 lb. whiting
(for 1 qt. of water-glue solution)

The canvas should be coated in the thinnest fashion with the priming solution (using the described sizing brush), and the excess of ground removed with a palette knife. The palette knife also causes penetration of the ground solution into the pores of the canvas. The brush and knife should not exert too much pressure upon the surface in order to prevent the canvas from being soaked through with the ground solution. The thinness of the ground coats is essential. One thick ground layer will crack, whereas a few coats of very thin layers will not have that tendency. The ground is dry as soon as the water evaporates. No artificial or sun heat should be applied to force the drying process. Should the chalk and zinc come off the surface when rubbed with the finger, this would indicate that too little glue was used. On the other hand, too much glue will cause the ground to crack no matter how thinly it was laid on the canvas. (The cracks are quite characteristic and are known as "glue worms.")

After the ground dries, which takes a few hours in normal temperature, take a fine sandpaper, remove all roughness and any fuzz or loose fibers sticking out of the weave. Should the fiber

or knots of the canvas become roughened by the sandpaper, another very thin coat of priming should be applied, because the following oil ground would be extremely difficult to effect upon a roughened fiber. *The fuzz will absorb the oil from the white lead color paste if not well bound by size or the ground solution.* The second layer can be produced by using thinner priming solution containing less chalk and zinc white. The glue and water proportions remain the same. The ground so far described is called *gesso* ground. But in this state it is unsuitable for oil painting as it will be far too absorbent. The below-described procedure will create a ground which is to a good extent non-absorbent and well recommended for oil painting.

(d) The Oil Ground

When the last gesso coat has dried, proceed with the oil priming. White lead should be used for this ground because of its extraordinary covering and quick drying capacity as well as its low oil content. (In the present day commercial manufacturing process, titanium white is mostly used in preparation of the oil ground. Titanium white itself is less apt to yellow; however, it takes a far greater amount of oil than the white lead ground. A good amount of synthetic resin is also added to it.) White lead oil ground will be leaner in relation to other pigments which absorb considerably more of the oil medium, hence it will not be entirely non-absorbent. Mix the dry white lead pigment with purified linseed oil to a pliable paste. (For handling of white lead see pages 28–9.) A small amount of mastic or damar varnish, about ½ oz. to 1 lb. of white lead color, or a ½% addition of cobalt

Courtesy of the Metropolitan Museum of Art

FREDERIC TAUBES — LILI

siccative may be added to speed up the drying and hardening process of the oil ground. (See page 24.) Spread with a not too flexible palette knife an even and thin film of white lead color upon the gesso ground. To do this properly the canvas must be perfectly stretched. If needed, keys might be now used to wedge the stretchers apart. Should the inside edge of the stretcher not be beveled enough, place a cardboard between the canvas and the stretcher, for the pressure of the palette knife might easily force up creases on the canvas lying over the edge of the stretcher. It is very difficult to eradicate such lines. (See page 76.)

The white lead coat should be permitted to dry in a light and airy place. Direct exposures of a semi-dry oil film to heat or "baking" it in sunlight would injure its surface. Under normal conditions such a thin ground is sufficiently dry in about two weeks to be painted upon. Should the ground be too rough, it can be smoothed with a fine sandpaper. It has been often said that the oil ground should dry anywhere from three to six months—or more, before using it. However, in the author's experience, this did not seem to be necessary. Tests over a period of more than fifteen years have shown that paintings executed on such a ground did not crack, darken or yellow in any way, and the canvas can still be rolled and unrolled after many years, without damage. The thinness of the oil ground is here essential.

The white lead color yellows considerably if the canvas is kept in a dark place. Humid atmosphere will accelerate the yellowing still more. If this happens, it should be bleached by exposing it

to a strong light before painting. The bleaching can also be effected by application of a white filter paper soaked in hydrogen peroxide upon its surface, and moderate heat (by putting the canvas not far from a radiator, for instance) would facilitate the bleaching process.

The oil ground is not suitable for a tempera underpainting.

(c) Semi-absorbent Grounds

Size the canvas as described in paragraph (b)
Add to 1 qt. of water-glue solution
1 lb. chalk, 1½ lb. zinc white
and up to 8 oz. of open kettle boiled linseed oil. (See page 16.)

The more oil added the less absorbent the ground becomes. The water-glue, chalk and zinc white solution should be poured into a container, whereupon the entire quantity of oil is to be added. To effect a proper emulsion, it will be necessary to shake the container vigorously for a few minutes.

This emulsion will then be applied on the sized canvas with the brush, and scraped immediately with the palette knife. (A thick solution might be applied with the knife only.) In a few hours the ground will harden enough to be smoothed with sandpaper. Proceed then with a second coat and using again the palette knife, try to obtain a very thin layer. On a coarser canvas another coat might follow. While working with the ground emulsion, one will experience a jellying of the same, especially by colder room temperatures. To prevent this one should keep the emulsion slightly warm in a double boiler, otherwise it will prove necessary to warm it up repeatedly during a prolonged working

period. Depending on its oil content, the ground thus prepared can be safely overpainted in 2 to 6 days. It is most suitable for a subsequent tempera underpainting. Due to the oil content, it will also have a slight tendency to turn yellow.

In case boiled linseed oil (linseed oil varnish) is not available, sun-thickened oil will be very suitable for this purpose or raw linseed oil. The latter is not quite as good. When using raw linseed oil one should permit the canvas to dry for a longer period.

(f) Priming of a Panel

The choice of a panel instead of canvas is recommended in the first place for tempera painting and in instances where the use of a palette knife for painting purposes is not contemplated. The board support being rigid is not responsive to the striking of the knife. One should also consider that the panel will be smooth and grainless, in contrast to the natural texture of the canvas.

PANEL MATERIALS:

(1) *Masonite*, pressed wood untempered. The tempered pressed wood which is processed with oil is not suitable for gesso ground. Manufactured in thickness of ⅛ or ¼ inch. Sizes over 20 x 24 inches will need wood reinforcements.

(2) *Vehisote* made of wood flour. Though it contains some oil, it is very lean and will hold gesso well. Thickness ¼ to ½ inch. Vehisote needs no backing to keep it straight. The smooth surface of the Vehisote will have to be roughened with a coarse sandpaper before application of the ground.

Gesso ground:

Water 1 qt.
Casein 3 oz.
Whiting 2 lbs.
Titanium dioxide 2 oz. (water-dispersion grade)

Casein: Mono-ammonium caseinate, a pure casein soluble in water. (Since casein dries exceedingly hard, it should be used preferably for board priming and not for canvas.)

(See formula for gesso on canvas which can be also used for boards, page 4.)

PREPARATION OF THE GROUND:

Casein should be sprinkled slowly into a small quantity of the cold water, while constantly stirring. To this mixture (when dissolved) the rest of the water is added hot. Upon the complete dissolving of casein, add whiting and titanium dioxide and mix it well together.

The ground should be applied to both sides of the board alternately (unless the back is reinforced). The first coat should be brushed in very thoroughly but thinly, and left to dry completely before further coats (up to four) are superimposed. Scraping of the ground with fine sandpaper should follow, if a smooth ground is desired. To render this gesso ground non-absorbent, one should *isolate it with a glue size (3 oz. glue to 1 qt. water), or damar varnish (1 part gum damar, 2 parts turpentine), or with a shellac solution (1 part white shellac, 2 parts alcohol. To obviate the brittleness of the shellac solution an addition of 5% of castor oil will be needed.)*

CHAPTER II

PAINTING MEDIUM

(a) Oils

Constitute the binding medium for the pigment. Of chief importance is

Linseed Oil.

The oil should be pressed in cold state. Cold pressed linseed oil is the superior product. When pressed in hot state the seeds yield more oil, but its quality is inferior and its color much darker. The oil extracted by means of chemicals is unsuitable for painting purposes. Linseed oil dries well, starting with surface oxidation and forming an outside skin (known as linoxine). The formation of this skin is considered one of the disadvantages of linseed oil. However, the linoxine is very elastic, due to a small quantity of olein which it contains. The olein remains unoxidized for a very long time and confers a great toughness and elasticity upon the oil film. A good linseed oil will dry in less than three days and is hereafter no longer sticky to the touch. (A glass plate should serve for drying tests.) Linseed oil should not be bleached chemically. There is, however, a simple method by which the raw oil can be bleached and purified. Contrary to the often heard assertion that the bleached oil returns to its original dark state if kept in darkness, the author could not detect any yellowing of the oil bleached in the described manner, no

matter how long it had been kept in darkness.

To Bleach and Purify Oil

Add first to one pint of oil 1 oz. of Fuller's earth (infusional earth also known as Kieselguhr. Another excellent product is sold under the trade name "Filtrol.") After a vigorous shaking with the filter material, the oil should be poured into a flat vessel to a height of about ½ inch and exposed to the sun's rays. The container should be covered with a glass plate to protect it from dirt. After a few days of continuous exposure the oil will be filtered through a filter paper, in order to free it from Kieselguhr and impurities. The oil thus prepared is lighter, has more body and by far better properties than the raw product, which is a poor painting medium.

For Grinding Dry Pigments

Use the cold pressed and purified oil. It should not be thick. The limpid medium will absorb a larger quantity of the color substance.

Thickening and Purifying of Oil

If we continue to expose the oil for a longer time to the sun's rays (upon the elimination of Fuller's earth) and instead of a glass vessel use a container made of lead, we will receive a highly siccative sun-thickened oil. After three weeks or more, depending on the climate, the oil thickens and reduces its original volume to some extent. The surface of the thick oil should be agitated daily (toward the end of the thickening process) to prevent the building of a skin on its surface which will occur when the oil is exposed for a considerable length of time to air

and sun rays. On the bottom of the lead pan a white, cloudy sediment of mucilage and albuminoid matter remains. The raw product will deposit a considerable quantity of sediment, whereas the purified oil will be almost free of it. While straining the oil into a bottle through a fine tissue, in order to remove the accumulated dirt during the time of the exposure, one should take care to eliminate the sediment. (Once the sediment gets mixed with the oil, the common filtering methods will not separate them again.) It is advisable to strain the oil while in a warm state, which facilitates the flow of the thick substance.

The sun-thickened oil is one of the most superior media we possess; it should have the consistence of a thick syrup. It can be used as a painting medium, pure or thinned with spirit of turpentine, or combined with mastic or damar varnish and Venice turpentine.

Acidity of Oil

Linseed oil might develop free acid which in turn can affect the stability of certain colors. The presence of the acid will be determined by the use of Litmus paper which will turn pink or red when dipped for a few minutes into the oil. Should it retain its original blue color the oil will be free from such an acid.

In order to neutralize the acid one should pour the oil into a flat vessel which has been covered with white lead oil color. In a few days the oil on top of the wet white lead color will prove to be free from acid. This procedure might be combined with bleaching of the oil.

One can also use quicklime (calcium oxide) to free the oil

from acid. A teaspoonful of pulverized quicklime will be added to one pint of oil and shaken in a bottle, whereupon the oil will be strained, and stored in well closed and filled bottles. A continuous access of air will render the oil viscous, produce free acid and impare its drying quality. It is advisable to keep a piece of hard quicklime in the bottle containing the oil or varnish. It will absorb moisture and prevent acid formation.

As mentioned before, linseed oil, if used profusely (not saturated with pigments), will wrinkle while drying. The oil absorbs first oxygen from the air and increases its bulk. Upon drying the loss of oxygen results in shrinking of the medium. If not saturated with pigments, even the best bleached linseed oil will have the tendency to yellow and to lose its transparency.

In a search for a more perfect medium, we will arrive at a compound which combines linseed oil with a resinous substance. For instance:

1 part of sun-thickened oil
½ part of mastic damar varnish
(1:3 to 1:5 in turpentine)
½ part of Venice turpentine

The proportion of the ingredients can be varied to suit one's purpose. It is not recommended to increase the content of mastic, damar, or Venice turpentine to a great extent. One should consider here the fact not only that linseed oil loses its body, but that all the natural resins evaporate to some extent in time. (This is well known by the dealers who experience a weight shortage of those resins during a prolonged storage.)

The advantages of such a composite are obvious. To begin with, we have homogenous materials, of great affinity for each other. Some quarters voice a different opinion; the author, however, relies on the support of certain respected authorities, and his own experience. The only logical consideration against that medium is that the pigments diluted with it, especially the glazings, are susceptible to removal in the future when forcefully cleaned by restorers. However, it is useless to bemoan prematurely the possible incompetence of a future restorer.

We have, to proceed with our medium, a sun-thickened linseed oil of great elasticity and excellent drying capacity, since the oxidation process of the linseed oil has been to a great extent effected by the sun's rays.

The addition of varnish insures a better drying of the composite throughout the mass, due to the evaporation of turpentine, which leaves microscopic openings on the surface, permitting free access to air within the oil and pigment compound. Mastic or damar varnish dries superficially as soon as the turpentine evaporates and the resin is quite hard in 12 to 24 hours; it prevents the wrinkling of the surface and brings out the colors to their best advantage. Venice turpentine, with its thick, honey-like substance, adds body to the medium, increases the brilliance and promotes the fusion of the pigments to an extent which linseed oil alone never could do. The danger of the mastic or Venice turpentine to become fissured and brittle in time is counteracted by the presence of the elastic, thickened linseed oil. The described compound dries well, in about 1 to 3 days. It does not incline to

yellow and if painted on a perfectly dry, non-absorbent ground, will not necessitate a varnishing for years. The materials employed must be, however, of an impeccable quality. Keep the medium in air-tight bottles.

Open kettle boiled linseed oil (linseed oil varnish)

Was mentioned in connection with the semi-absorbent grounds. It is, as its name indicates, linseed oil boiled in an open kettle with the addition of siccatives, mostly salt of manganese. It is quite fat, much darker than the raw linseed oil, dries rapidly and with a considerable gloss. (Even if boiled without the drier, linseed oil will acquire a much darker color.)

Stand Oil

Is linseed oil boiled under carbon dioxide or hydrogen, that is, without access of air and without the siccatives. It is boiled during a period of 48 hours and at a temperature reaching 460°F. It is extremely sticky and heavy and dries slowly. An addition of ½% of cobalt drier will remedy this disadvantage. It contains mostly free acid which should be neutralized. (The viscous stand oil will be thinned with turpentine or varnish before quicklime is added.) Stand oil is also known as polymerized oil. Polymerization of oil means grouping the molecules into larger molecules, a change which occurs due to the heating process.

Stand oil will be employed as a painting medium when diluted with turpentine or preferably with damar or mastic varnish, usually in the proportion of 1 part of stand oil and 1 part of varnish. However, one can vary the proportions to suit one's purpose. Such a medium will render an enamel-like surface and effect an

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FREDERIC TAUBES

CALIFORNIA LANDSCAPE

extraordinary fusion of pigments. The brush strokes flow together in similar fashion as when one uses Venice turpentine. It is useless to mix stand oil with linseed oil, raw or thickened, or Venice turpentine. The only disadvantage of stand oil as a medium is its high gloss; on the other hand, its linoxine is extremely tough and weather resistant. This accounts for the use of stand oil for outdoor commercial painting.

Overpaintings are difficult to execute on such a glossy surface. One should scrape the paint layer off when corrections are needed. A carefully prepared stand oil yellows less than any other form of linseed oil. The old masters valued the properties of the boiled and thickened oils and often employed them. Stand oil originated in Holland and many of the early Dutch paintings point to its use. It is proven that Rembrandt employed it extensively.

Stand oil, furthermore, will be most serviceable as an addition to the final picture varnish and in preparation of tempera emulsion.

Poppy Oil

Is much lighter in color than linseed oil. It is supposed to yellow less and dries much slower than the latter. It also forms a skin, but in a lesser degree. It has not quite the toughness and elasticity of linseed oil. It inclines to become rancid and quite thick if kept in open bottles. If a slow drying process is desired, poppy oil is a most appropriate medium. The good properties of poppy oil would be useless if applied on semi-absorbent or porous grounds. Only a perfectly dry, non-absorbent oil ground, and the use of

the slow-drying zinc white, ground in poppy oil, instead of white lead, and avoiding the use of quick-drying colors, and all such ground in linseed oil, would permit the painting to stay wet for a longer period. Poppy oil can be mixed with linseed oil if one desires to combine their qualities.

The oils dry better in light, dry and warm atmosphere. Darkness and moisture retard the oxidation.

(b) Varnishes

Resin, dissolved in a volatile medium such as spirit of turpentine, will give us the varnish. Among the varnishes on the market those prepared from mastic or damar, the soft resins, will find a wide use in oil painting. Mastic is the resin of the pistachio tree. It is found in the Levant, and in Greece, and the best quality comes from the island of Chios. It is used in turpentine solution as an addition to the painting medium, as final picture varnish, and in preparation of the tempera emulsion. It is almost colorless when dissolved in a cold state; the commercial product is darker, due to melting of the resin. With age it becomes brittle and fissured. The same applies to the damar, a pine resin from New Zealand and the East Indies. In dry form it is less elastic and softer than the former; however, it decomposes equally during the same period. It is said that damar varnish is less apt to produce "bloom." (See page 73.)

Both mastic and damar varnish can be easily and very economically prepared in the studio. Mastic resin is sold in pea-like drops, slightly yellow, and the damar in semi-transparent, white, opalescent lumps. Reduce the resin to powder by crushing it in a mortar. Put the powder in a bag of muslin, linen, or several layers of cheese

cloth and submerge it in a jar filled to three-fourths of its content with normally cold rectified turpentine. The bag should be freely suspended from the lid of the jar and the same tightly closed to prevent turpentine vapors from escaping. The bag will also retain impurities which the resins generally carry.

Damar will dissolve in turpentine in a few days. In case of mastic, weeks will be needed to effect the solution. It is useless to add any foreign body to powderized resins, such as sand or glass beads, to prevent its agglutination. The author could not verify any advantage of that often recommended procedure.

In case a speedy dissolution of the resins is desired, one will use the hot melting process. This is effected by heating the resin in a metal cup on a stove (not in direct contact with the flame, in order to avoid combustion of the resin). In a short while, under continuous stirring, the resin liquefies, whereupon a small amount of distilled petroleum or toluol (for retouching varnish), or turpentine (for picture varnish) will be added; a larger quantity of those cold solvents would make the resin congeal. (Do not pour the inflammable solvents from the bottle; use a spoon!) After a thorough stirring the cup will be removed from the stove and the balance of the solvent added. A cloudy solution may be filtered through a filter paper. Often, however, the sediment will settle on the bottom of the flask, and the clear varnish can be poured off. While filtering the varnish, keep the jar tightly closed. It must be stated, however, that the quality of the varnish produced by the cold method is superior to that produced by heating.

The weight proportions of the turpentine and resin for varnish-

ing and painting purposes should be about:

1 part of mastic or damar

2 to 4 parts of rectified turpentine

To obviate somewhat the brittleness of these resins and to render the varnish more pliant as a final picture varnish, 5 to 10 percent of stand oil will be added. In the latter case the varnish will need more time to dry thoroughly. Only the best quality of turpentine should be used as a solvent for the varnish. It must also be perfectly free from any moisture. A carefully prepared mastic or damar varnish obtained from the best materials will not yellow to any extent, no matter how old it is.

In contradistinction to the soft resins, copal and amber are classified as hard resins. The often heard opinion that "all resins compounded in hot oils are harmful" needs some amplification. Copal and amber are fossil resins. They are roasted first before being dissolved under prolonged cooking in linseed oil. This accounts for the dark brown color of this varnish. Hard resins can also be dissolved by several different methods, some of which produce a light-colored varnish. However, without proper equipment and laboratory experience, the painter cannot compound that varnish in the studio. Copal as well as amber, as sold today, is mostly an inferior product. Zanzibar and Sierra Leone copal, the sorts which possessed the required property, have almost disappeared from the market. Amber varnish when genuine is extremely expensive and not easily obtainable. The problem of all these oil varnishes rests with the intelligent use of them. The thick, fat varnish will darken. On the other hand, it is more elastic and tougher than any other

varnish, and practically impervious to atmospheric attacks.

As an addition to the painting medium, the hard resins are very valuable and if properly thinned with turpentine, they might also be used as a final picture varnish. The main difficulty here is to obtain a carefully prepared, unadulterated product. It is said that some British firms are still manufacturing a dependable quality of copal and amber varnish.

Retouching or Intermediate Varnish

Is essentially the same product as the described picture or painting varnish. The only difference between these varnishes is that the retouching varnish is much thinner and is compounded with a more volatile medium, such as distilled petroleum or toluol, usually in the proportion of one part of resin to five or six parts of the solvents. The author employs the following formula which, after many tests, seemed to yield the best results:

1 part damar
1 part toluol
1 part distilled petroleum
3 parts turpentine

Retouching varnish can easily be prepared in the studio, in the same manner as the heavier picture varnish (described on page 18). Since the resins dissolve much quicker in toluol or petrol than in turpentine, they need not be pulverized. After the sediment remaining on the bottom of the container has settled, the clear varnish should be poured off. To clear the varnish instantly one might add to one pint of varnish, one teaspoonful of alcohol. After vigorous shaking, the sediment is deposited at once.

Due to its highly volatile toluol and petrol basis, the varnish dries rapidly, and can be painted upon right after its application. It acts then as a siccative and lends a great cohesion to the superimposed layer of paint, with which it incorporates. In case a siccative action is not desired, one should wait a day after the application of the intermediate varnish before proceeding with the painting.

The retouching varnish also prevents the trickling of the subsequent oil painting by isolating an oil-saturated surface and brings out sunken-in colors. (See pages 56–7.) It is, furthermore, almost colorless and does not yellow. It is not sufficient as a final picture varnish because of its faint resistance to atmospheric attacks. It renders good service, however, until the time when the heavy picture varnish can be applied.

Rectified Petroleum (refined kerosene, boiling point 181–260C)

Is a volatile and thin solvent for resins and oils.

Toluol (Toluene, a coal-tar derivative)

Is a much stronger solvent and should be used with great care. It will easily remove undesirable parts of a painting, especially when the pigments have not hardened throughout. Resin-hardened brushes may also be washed in it and old paintings may be cleaned with the same medium.

Venice Turpentine

Is a balsam and contains 80% resin and 20% terpene. Balsams are exudations from trees and the original product known under the trade name of Venice turpentine, is a pitch of the larch tree from southern Tyrol. Often the domestic product known as Canada balsam is substituted for Venice turpentine. It is equally as

serviceable as the former. It has a characteristic odor of pine from which it is obtained. Both balsams come in the consistence of a thick honey, but Venice turpentine has a greenish cast in contrast to the Canada balsam which is bright yellow. The balsams produce as a medium soft, enamel-like effects, comparable to the effects achieved by the use of stand oil. They also aid the fusion of the colors to an extraordinary extent and dry very slowly. The soft resin of the balsams fissures easily, but in combination with the thickened linseed oil, for which they have great affinity, that detriment will be counteracted. An excessive use of the balsams is, however, not advisable.

A rectified oil of turpentine (pine resin) is called **Spirit of Turpentine.**

A good turpentine is colorless and smells pleasantly, in contrast to the inferior sorts which are acrid and sharp of smell. It will not leave any spots on paper moistened with it after it evaporates. The degree of inflammability of turpentine also indicates its quality; the better turpentine will burn more readily. Turpentine should be kept in full bottles and well-stopped to prevent access of air. The air renders (the inferior) turpentine quite viscid and the resin formed known as colophony or rosin is inferior. Such turpentine would dry badly. The American C.P. (chemically pure) turpentine remains limpid for a long time, even when exposed to air.

Turpentine is not a painting medium because it has no binding power. It can be used as an addition to the painting medium and to outline the drawing on the canvas.

(c) Siccatives

Or driers, are metallic compounds, such as salt of lead, manganese, or oxide of cobalt, dissolved first in oil and thinned in a volatile medium such as turpentine. The driers act as a catalyst, that is, they are a third body which facilitate the oxidation. Even after the painting has dried completely, the oxidation of the metallic compound remains active.

Siccative de Haarlem is a comparatively harmless compound of boiled linseed oil, driers and damar. Manganese or lead siccative (Japan size, siccative de Courtrai) should not be employed. Excessive use of siccatives causes irreparable damage to paintings such as cracking, discoloration and blackening. By far the safest of the siccatives is the cobalt drier. Two or three drops of the siccative mixed with a teaspoonful of slow drying oil color, will accelerate its oxidation considerably. *The siccative should not exceed ½–1% of the weight of paint, oil and pigment mixed with it.* A thin painting will be dry in less than 24 hours, even when ½% of cobalt siccative was used.

(See detailed directions for measuring of small quantities of siccatives—page 95.)

Cobalt siccative might be used in such small quantities for oil grounds or the underpainting. When siccative is used for the final painting, one must be absolutely sure that the painting ground has dried thoroughly.

CHAPTER III

THE PALETTE

THE following list enumerates the fundamental and in the author's opinion indispensable pigments. They are all permanent (light resistant), some absolutely, a few to a great extent, and most of them compatible with each other:

White	1. White Lead
Blue	2. Prussian Blue
	3. Ultramarine
Green	4. Chrome Oxide Green Transparent
Yellow	5. Yellow Ochre
	6. Naples Yellow
	7. Cadmium Yellow Light
	8. Cadmium Yellow Medium
	9. Cadmium Orange
Red	10. Cadmium Red
	11. Venetian Red
	12. Indian Red (or Mars Violet)
	13. Alizarin Crimson
Brown	14. Burnt Sienna
	15. Raw Umber or
	16. Burnt Umber
Black	17. Ivory Black

This list of colors can be advantageously enriched with the following pigments:

White	1. Zinc White
Blue	2. Cobalt Blue
	3. Cerulean Blue
	4. Manganese Blue
Yellow	5. Dark Ochre
	6. Mars Yellow
	7. Mars Orange
	8. Zinc Yellow
	9. Ultramarine Yellow
	10. Cadmium Yellow Dark
Green	11. Chrome Oxide Green Dull
Red	12. Vermilion
	13. Mars Violet Dark
Brown	14. Mars Brown Light
	15. Mars Brown Dark

Some of the colors enumerated above are obtainable only in dry form and rarely in tubes. The colors should be uniformly ground in linseed oil, in preference to poppy oil, if quick drying of the pigments is desired. A color ground in poppy oil is, therefore, not quite suitable for the underpainting. (Only Prussian blue will be ground in poppy oil, or ½ poppy oil, ½ linseed oil. See page 31.)

ARRANGEMENT OF COLORS ON THE PALETTE

As shown in the order below, is practical and logical. There are no set rules for the organization of a palette. However, one should

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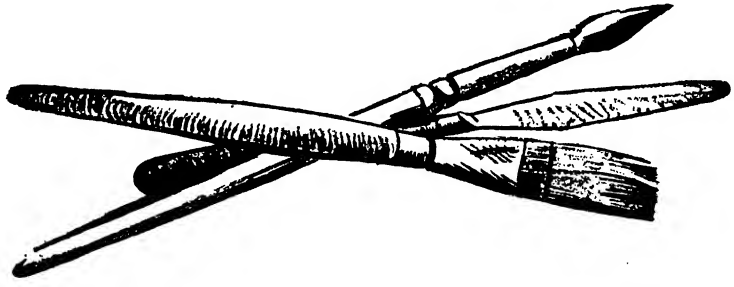
STUDIO INTERIOR

not change the sequence of the colors but acquire the habit of placing the pigments where one expects to find them, without being obliged to scout for them all over the palette.

Cadmiums	*Yellows*	*White*	*Blues*	*Greens*
Browns				
Reds				
Black				



CHAPTER IV

CHARACTERISTICS OF COLORS

White Lead, flake white (the best sorts are known as Chremnitz white), was the exclusive white of the ancients. As the name indicates, it is a lead compound. It possesses excellent covering capacity, great density and a heavy body. It solidifies the admixture of oil and has a strong siccative character through its readiness to absorb oxygen from the air. It seldom fissures or cracks even in the oldest paintings and imparts toughness to all colors mixed with it. Since it requires but little oil (about ten percent rendering it pliable), it is most suitable also for grounds and underpainting. The danger of white lead turning black in sulphur-polluted air has been in so far exaggerated as sulphurated air is not commonly present in apartments, galleries, etc. In more than twenty years of using white lead, the author's paintings did not seem to have encountered sulphurated air and did not experience any blackening of the white pigment. Should this, however, happen it can be bleached again. (See page 7.)

White lead applications should dry in well lighted rooms, as it easily turns yellow in darkness. Exposed to strong light, it will regain its white color. Often such exposures must be carried out during a period of many months.

It is advisable to grind the pigment in the studio to a stiff consistency and to avoid any excess of oil. The white lead powder can

be easily mixed with oil with a strong palette knife on the palette. The coarser sorts will be ground with a muller on a sand-blasted glass plate. It has been found that the pigment, if ground with poppy oil, retains its whiteness longer. In mixtures with other colors it renders warmer nuances than zinc white, and a warm grey, if mixed with black (in comparison, zinc white and black would yield a bluish grey). It should not be mixed with vermilion (although some sorts of vermilion do not suffer at all in combination with white lead). Alizarin crimson is apt to fade in mixtures with white lead.

One should remember that white lead is the backbone of almost every painting, since being mixed with practically every other color, it dominates in quantity all other pigments. In buying the pigment one should endeavor to obtain an uncut material, as the commercial product might be adulterated with barium. Such an adulteration can easily be detected by dissolving the white lead color in dilute nitric acid. Pure white lead will dissolve in it completely. Any remaining white sediment will indicate the presence of the barium.

White lead is poisonous. One should beware of inhaling the light powder dust. It flies up easily in drafty places, or when transferred from the container to the palette. Also, open wounds should not be brought in contact with the pigment.

Zinc white, a carbonate of zinc, has been in use for about a hundred years. The lustrous white powder takes a far greater quantity of oil than the white lead. It is, therefore, unsuitable for oil grounds and underpaintings. It often shows a tendency to crack and scale

(especially in lower layers), its covering capacity is inferior to that of the white lead, and with age that characteristic becomes more apparent and it loses its opacity.

It has a light body and fine grain and is, therefore, easy to spread and smoother in application. It retains its whiteness and dries slowly, especially if ground in poppy oil. It renders cool, chalky, silvery tones in mixtures with other colors, and in spite of its partial disadvantages can be quite useful at times. It is advisable to grind the zinc white in the studio which can be easily done with a palette knife on the palette. Too much pressure should not be exerted to avoid crushing of the slight body of that pigment. After a day, the mixed oil-color will again absorb a large amount of the dry pigment, whereupon it can be used for painting.

Ultramarine blue or French ultramarine, as used today, is an artificial product (approximating chemically the genuine ultramarine of the ancients, which was obtained by grinding the mineral lapis lazuli). It has a slightly violet nuance (one can also obtain the dry pigment free of the violet hue), requires much oil, dries moderately well, is quite transparent and, therefore, most suitable for glazing.

Cobalt blue (oxide of cobalt with aluminum oxide). A rich blue of violet hues, good tingeing and moderate covering capacity. Although absorbing much oil, it possesses excellent drying properties.

Cerulean blue, or coelin blue (oxide of cobalt with tin oxide). The pigment is more opaque than any other blue on the palette, of coarse body, and its greenish hues are excellent for rendering distant atmospheric effects. It dries well, and has a good tingeing capacity.

Manganese blue, a comparatively new and very permanent color of light hue, possesses slight body and moderate tingeing capacity. It dries rapidly and accelerates the drying of other colors mixed with it. Suitable for glazing.

Chrome oxide green transparent, also known as viridian green and vert emerauld (oxide of chromium). A slow-drying, very transparent pigment, of fine body and slight tingeing capacity, requiring much oil. Its distant and cool nuances are most suitable for atmospheric effects. A typical glazing color.

Chrome oxide green opaque (oxide of chromium dull), a moderately well-drying extremely dense pigment of greatest covering and tingeing capacity.

Prussian blue, or Parisian blue (iron ferrocyanide), a most powerful, transparent blue of greenish hues. It takes a good amount of oil and dries rapidly (the tube should always be well closed as an excess of air granulates and crumbles the pigment. Especially if ground in linseed oil Prussian blue often jells to a consistency of rubber.) Its tingeing power is extraordinary and a slight addition of Prussian blue suffices to change the hue of any color combination. It is quite permanent. Some quarters reject Prussian blue because it is supposed to swallow up other colors or to "bleed" through. However, any color of equal potency (like Indian red, chrome oxide green dull, and some sorts of iron oxides, would swallow up a less powerful pigment). Because of its excellent siccative qualities Prussian blue is very valuable for underpainting, especially where cool green, blue and neutral tones are desired. To attribute bleeding to Prussian blue is completely erroneous.

The Earth Colors—Yellow ochre, dark ochre. Natural earth or mineral colors are chemically dead, inert pigments, which accounts for their greatest stability, providing they do not contain impurities. They consist of about 80% of clay and 20% of coloring matter. They have a coarse body and more or less good covering and drying qualities. A transparent variety is called gold ochre; its tingeing capacity is slight and its usefulness limited.

Mars yellow, Mars orange is another useful color related to the ochres. The Mars colors are known as artificial ochres. This iron oxide has good covering and strong tingeing capacity. It can also be used for glazing. Often Mars yellow is added to ochre, thereby creating a pigment possessing the good body of the earth color and the brilliance of the iron oxide. Most of the Mars colors have a very light body.

Mars brown—light, medium and dark. They possess all the characteristics of the Mars colors. If a slower drying brown is required than the umber, a combination of the Mars browns might replace the latter. When glazing or scumbling one should remember that the earth colors will not produce the same effect as the more transparent Mars colors. For opaque applications, Mars colors are equally suitable.

Burnt sienna (calcinated raw sienna) is a fiery, semi-transparent color of good tingeing power and light body. It dries slowly and carries a great amount of oil. Its rich and luminous hues are quite important for the palette. Of all the red tints, burnt sienna is most suitable for glazing applications.

Raw umber, Cyprish umber, earth color containing manganese

oxide, is dense, opaque and of a pleasant greenish brown hue. When calcinated it is known as **burnt umber** (a darker brown-red hue). The umbers are the best driers of the entire palette. Their siccative action on other colors is such that even the slowest driers, like cadmium or vermilion, will dry rapidly if mixed with them. Therefore, one can use umber with greatest advantage for underpainting.

Venetian red, also known as Titian red, English red, Terra di Pozzuoli (iron oxide). They are all good driers, of coarse body and great tingeing capacity. The hues of these colors are closely related to each other, Terra di Pozzuoli (when genuine) being the lightest red and English red possessing a darker tone.

Indian red (iron oxide), which has almost the same hue as Mars violet, ends for us the list of the earth colors. It is an extremely dense pigment containing but little clay and possessing, therefore, the greatest tingeing power.

Naples yellow. The true Naples is a lead antimoniate and as such not always obtainable today in tubes, but one can procure the genuine product in dry form. An imitation of lead antimoniate is mostly used now, chiefly a mixture of permanent white, cadmium yellow and Venetian red, which has not the good qualities of the true Naples. Naples yellow is an opaque and dense color and has excellent drying properties. Its chief advantage is that it produces a "distant effect," whereas cadmium yellow yields local, advancing colors; Naples yellow will not "jump out" if used, for instance, in backgrounds. The unique tone of the true Naples can be only to an extent reproduced by other mixtures.

Zinc yellow. Zinc chromate. It has a light greenish-yellow cast, good body, slight tingeing capacity, and requires much oil. It dries well and can be advantageously used for glazing, mostly in mixtures rendering greenish hues. (Its yellow color cannot be considered as permanent and it often turns green.)

Ultramarine yellow. Barium chromate. It has a slight body and tingeing capacity. It should preferably be used in combination with ultramarine blue, chrome oxide green transparent, etc., where it renders beautiful greenish tints. Its hue approximates Naples yellow.

The cadmium yellows (cadmium sulphide). The light, dark and orange variety all possess brilliant and glowing hue, excellent tingeing capacity, and are semi-opaque. The cadmiums are all slow driers and retard the drying process when mixed with other colors. One should consider that characteristic in connection with the underpainting.

Cadmium red is also a valuable color for glazing. It is more reliable than the sometimes treacherous vermilion and may be substituted for the latter, although it does not possess its great luminous beauty. It can be obtained in light, dark and purple hues.

Vermilion (sulphide of mercury), as mentioned before, is a capricious pigment. Some sorts are absolutely stable, some alterable. If coarsely ground, it is said to be most permanent. It is dense and opaque. Sometimes it blackens when mixed with white lead, but only if it contains impurities, such as free sulphur. This hypothesis, however, has not been completely verified. It is also often sensitive to light, blackening in spots and not throughout the mass. It should

best not be mixed with any other colors but umber, black or Mars brown. For mixtures with other pigments cadmium red might be employed in preference to vermilion.

Alizarin crimson is a synthetic substitute for madder lake (an organic product derived from the root of the madder plant), generally more permanent than the latter and the most permanent of the lakes. The dye stuff is precipitated on a base of aluminum hydrate (a colorless pigment). It is highly transparent, of fine body, absorbs an excessive quantity of oil and dries very slowly. Some amount of sun-thickened oil and varnish might be added to the hand-ground color to improve its body and drying properties. It should not be thoroughly compounded with the oxides, or with white lead, which absorbs a great deal of oxygen. Alizarin crimson will fade in such mixtures. The reasons for the occurrence of chemical changes in such combinations are still disputed. In any event an intimate mixture of this faint glazing color with any pigment of strong tingeing capacity will always be doubtful. The madder lake is often found very well preserved as a pure glazing color, even on paintings of the pre-Renaissance.

Ivory black, produced by charring animal bones, contains carbon and ashes. Excellent covering capacity. It dries very slowly; a trace of umber accelerates its oxidation. The depth of the black color is easily lost even by a slight admixture of a light pigment.

Mars black (iron oxide) is also a useful pigment, rendering colder and not as beautiful hues as ivory black. It dries much better than the former, and has a greater tingeing power.

NOTES ON COLORS

As described on preceding pages, the colors vary in their drying tendencies. Generally the oxides hasten the drying process and the sulphides delay it. The pigments are richer or poorer in oil content. Usually the dense and opaque color requires the least oil.

We may divide them into cold and warm colors. The blues and greens have the optical tendency to recede, the warm colors to advance. Strong colors, too, seem to advance, and the dull and softer to recede.

Also, there are transparent and opaque pigments. The transparent colors generally have a fine body, while the opaque colors are more granular and coarse.

One can combine the colors on the palette thoroughly, create an intimate mixture, or intermix the pigments but slightly. In the first case, the mixture becomes duller the more it is compounded into one unit. The irradiation of the minute particles of the pigments decreases, the color becomes dead. According to experience, the colors should not be radically compounded with each other, as later darkening might result.

The less one blends two or more colors into one unit the more brilliant the effect of the pigment will appear. For example, the complementary colors such as green and red, when well mixed would give a dull grey, whereas green and red pigments taken on the palette knife or brush without mixing (but blended swiftly on the canvas, with possibly one stroke) would render an entirely different effect.

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FREDERIC TAUBES — WOMAN AT CURTAIN

The transparent, glazing colors should not be used in a pastose manner; such an application would be against the nature of a glazing color.

Particularly, pigments of a different body structure should be but slightly intermixed, to prevent colors of lesser strength from being swallowed up by those of stronger body and greater tingeing capacity.

Should the tube color be too thin and contain too much oil, an addition of the dry pigment to the oil colors on the palette will improve their body. As a rule, the tube color will have a much finer body than the hand-ground material. A pigment compounded in a mixer and a mill will be more crushed which in turn might impair its quality.

GRINDING OF COLORS

It is decidedly advantageous (and besides very economical) to grind the pigments in the studio. The "grinding" means rather mixing of the pigment with oil, since the present-day products are so well pulverized that a thorough combining of the color substance with oil by means of a palette knife (to a workable consistency) will prove in most cases sufficient. Larger quantities of pigments might be advantageously ground with a pestle in porcelain mortars. It is advisable to use a separate mortar for the white pigment, the cold and the warm colors. Some pigments might possess too coarse a body; in this case they should be ground with a muller on a sand-blasted glass plate.

Purified linseed oil will serve as a binder. As mentioned before,

a viscid or thickened oil would be entirely unsuitable as a grinding medium. Poppy oil is an excellent binder, in case a slow drying quality of the colors is desirable.

Before starting to paint, one might add some mastic or damar varnish to the color ground in linseed oil (about ten to twenty drops to a teaspoonful of paint). The drying process of such a resin oil color would be accelerated and a greater brilliance insured. Especially the drying quality and the body of ivory black and Alizarin crimson can be greatly improved when some varnish (1 to 2 in turpentine) and sun-thickened oil is added to a color ground first stiffly in pure linseed oil. One can also use siccative to accelerate the drying of these pigments.

The pigment mixed with oil should be heaped up on the palette (for a few days' use), or it can be put into tubes. (Use a palette knife to fill the tubes.) In the latter case one should observe certain precautions to prevent the separation of oil and some of the pigments while stored in tubes.

Addition of beeswax, aluminum stearite or clay (sometimes water is used or tempera emulsion) *will prevent the separation of pigment and oil.* It will also make "short" a color which has the tendency to run (like house painters' colors). A running color has, however, no disadvantages, providing it is not too thin. As a rule, the finer a color is ground the easier it separates from the binding medium. Colors ground to dust will need in any event an addition of one of the above mentioned compounds for a proper suspension in oil. In order to combine wax with the pigment, we must first

compound the wax and the oil with which the dry pigment is to be mixed.

To compound oil with wax

First dissolve ½ oz. of pure, unbleached (or sun-bleached) beeswax in ½ oz. of rectified turpentine, by warming it up carefully in a metal cup or in a double boiler (to prevent the possibility of turpentine combustion). Add the turpentine-wax compound to 25 oz. of linseed oil. This constitutes a 2% wax solution. Both turpentine and oil should be combined in a warm state. Before grinding the color in the described compound, one should heat it, and as the wax and oil ingredients combine, the solution loses its turbid appearance.

Aluminum stearite is a metallic soap. It is obtainable in powder form and shall not exceed 2% of the amount of the paint. The powder should be formed with some water and alcohol to a stiff paste and then thoroughly mixed with the oil color. For instance, 3 oz. of paint (about the normal studio size tube) will receive about ½ of a teaspoonful of aluminum stearite (between 1 and 2%). (See page 96.)

Clay (aluminum silicate), a decomposed feldspar, has no covering power. It can be added to the artificial iron oxides in order to prevent the pigment and oil separation and to improve their body. (An addition of the natural ochre, raw or burnt sienna might serve the same purpose.) Clay should be first mixed with oil and then with the colors. A tube of color will receive from one to three

teaspoonfuls of clay, depending on the quality of the materials.

It is sometimes difficult to say beforehand which color will need an addition of the mentioned materials because the pigments behave differently, depending upon their quality and the manufacturing process. One should experiment with the colors (put them first in small tubes), and then determine their characteristics. Only a very few pigments, such as some of the Mars colors, Cerulean blue or vermilion, will require a tempering with wax, aluminum stearite or clay. (To combine these ingredients with pigments thoroughly, use mortar and pestle.)

It has often been recommended to warm up the earth colors before mixing them with oil, in order to dehydrate the clay which they contain. Clay attracts moisture from the air and some of the earth colors consist of 80% clay. However, some amount of water makes the color short without impairing its quality. When earth colors are ground on extremely humid days, they will absorb as much as 2% of water from the atmosphere, which can be regarded as a permissible limit.

Most of the colors ground by hand and stored for some time in tubes will prove to be too thin. The excess of oil should be eliminated by putting the colors on a porous paper (newspaper), or by adding some more of the dry color before starting to paint. (The commercial pigments are ground under great pressure, hence more material can be compounded with oil.)

CHAPTER V

COMBINATION OF COLORS

THE color combinations described in this chapter consist of two pigments, and white if specifically stated.

White mixed with other pigments cuts the intensity of the colors and reduces the hues to "pastel" shades. Black also dulls the color mixtures. The idea sometimes voiced that an admixture of black contributes to the future darkening of a painting is without any substantiation.

White lead and zinc white are compatible colors and when mixed are said to combine their characteristics.

Ultramarine blue mixed with chrome oxide green transparent and white or Naples yellow renders delicate, atmospheric greens. With ochres, dull greens; with cadmium yellow and orange or Mars yellow, vivid green. With umber and white, greys; with reds, violet. With Alizarin crimson, deep crimson. It is also most suitable as a glazing color.

Cobalt blue has a similar scale with the violet hues predominating.

Cerulean blue with ultramarine yellow or Naples yellow and white—for atmospheric effects. Strong green hues, with Mars yellow and cadmiums; with reds and Alizarin crimson, deep violets. Greys with umber and white.

Manganese blue produces beautiful green hues in mixtures with chrome oxide green transparent or ultramarine yellow. This pig-

ment would be useless in combination with opaque colors of strong tingeing capacity.

Chrome oxide green transparent, in addition to the combinations already mentioned, when mixed with Venetian red, produces greys of extraordinarily rich hues. (It should not be thoroughly compounded in such mixtures.) With Prussian blue and white, cold silvery green. With cadmium yellows, vivid light greens. Excellent for glazing over contrasting colors.

Chrome oxide green dull, to be mixed only with pigments of similar density and coloring capacity. It swallows up all the transparent pigments. With Prussian blue it renders dull greens. Neutralizes earth reds to powerful warm greys.

Prussian blue has a strong tendency to produce green hues with all the warm colors—with the cadmiums, yellow, orange or red—intensely green; and silvery blue-green, when white is also added. With burnt sienna—the deepest green. With English red and white, peculiar distant greens. With Naples, cold luminous greens. Dull greens with ochres. With umbers and white, all the variations of cold, warm or silvery greys. With Alizarin crimson, the deepest purple. These two latter pigments, however, should not be thoroughly compounded.

Naples yellow in mixtures mentioned. Also, with black—neutral greens. It lightens up ochres, umbers and burnt sienna. Mixed with earth reds, it yields a warm pink.

Yellow ochre livens and lightens up the earth reds and umbers. With black, a dull green color results. It cuts the fiery hue of burnt

sienna. Dark ochre is, as the name indicates, a darker and duller variety.

Mars yellow renders in similar combinations more fiery hues. Strong greens with the cold colors.

Zinc yellow should be used in combinations where a less powerful and more transparent tone, as that of the cadmium, is desired, mostly for green tints. The same applies to ultramarine yellow.

Cadmium yellow—light, dark and orange—gives life to ochres, earth reds and umbers. With burnt sienna, a fiery red. With black and white, a dull green. With Alizarin crimson, iridescent reds. (Do not compound the last pigments thoroughly.)

Cadmium red in similar combinations as the cadmium yellows. More suitable for glazing than vermilion. Produces rich and brilliant nuances when glazed upon yellows and blues.

Burnt sienna in all the mixtures already discussed. It livens up umbers and warms up the cold ivory black with ochre—beautiful vivid browns. Because of its transparency it is most suitable for glazing.

The umbers—with black for darkest browns. With vermilion or Venetian red—warm, saturated brown reds.

Venetian red—fiery reds with Alizarin crimson (do not compound thoroughly), dull reds with black, and pink with white.

Indian red (or Mars violet). This powerful color should be mixed chiefly with equally potent pigments. It swallows up all of the lighter colors. Even the fiery Prussian blue is too light of body to cope with it. The opaque cadmium yellows lighten it up. Black

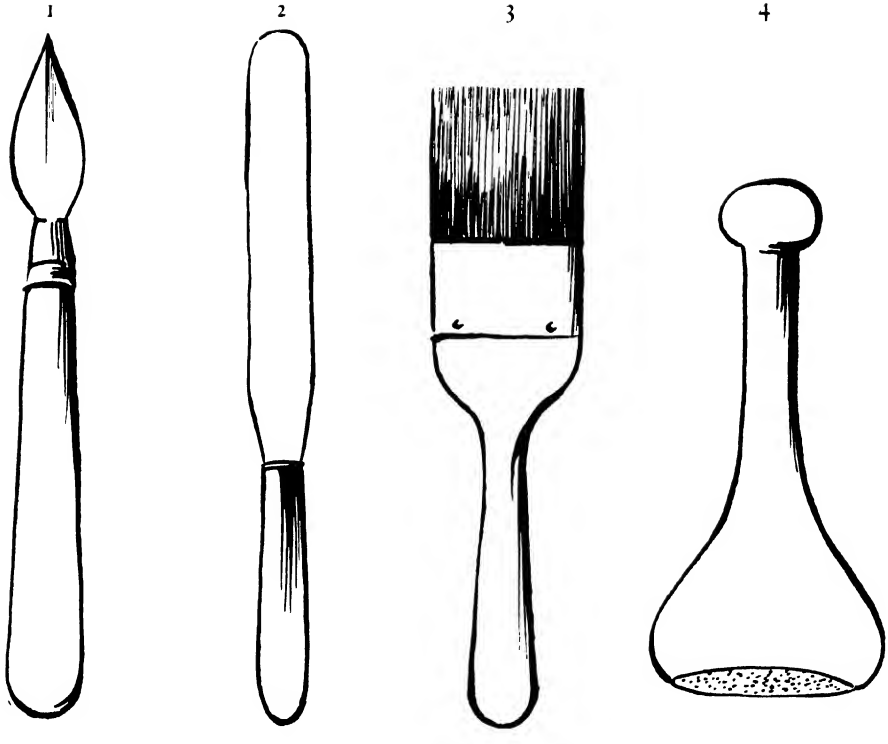
or umber dulls it, and chrome oxide green dull neutralizes it. It gives a tough and unpleasant violet with white.

Alizarin crimson is an exclusive glazing color and produces rich, fiery tones when glazed upon earth reds, vermilion, cadmium yellows and orange. Also most appropriate for glazing over cold colors. The old masters employed madder lake almost exclusively as a glaze on a monotone underpainting.

Vermilion—it loses its intrinsic beauty and extraordinary luminosity when mixed with other colors. It should be applied freshly with but few strokes, and if darker tones are desired, deepened with umber, Mars brown dark or black. For mixtures with the rest of the palette, employ cadmium red instead of vermilion.

Ivory black—when mixed with Alizarin crimson, it renders a deep warm purple-black. It dries very slowly in such a combination, and a medium richer in resin should be used here or an additional siccative if quick drying is desired. Also, Indian red warms up the hue of ivory black. For colder tones add Prussian blue, cobalt or ultramarine blue.

The combinations of colors here mentioned should constitute only a basis for individual explorations; coloristic ability is not an a priori *matter, but the result of an empirical knowledge of the entire palette and its possibilities.*



PAINTING TOOLS

1—SCRAPER
2—LARGE PRIMING KNIFE. BLADE 7″ LONG, 1½″ WIDE
3—SIZING AND PRIMING BRUSH, 2″–4″ WIDE
4—MULLER, GRINDING SURFACE, 2″–3″ DIAMETER

CHAPTER VI

PAINTING TOOLS

The bristle of the brush should not be too long as the long bristle will not have the strength to carry a good amount of pigment. Only the big sizes, number ten and up, will, of course, be proportionately longer. Very small, flat bristle brushes under number six are of little use, and round bristle brushes in any size rather useless. Small flat, as well as round brushes should be made of sable hair. In addition to the bristle brushes, one should carry a complete assortment of these flat and round sable brushes. They are also invaluable for blending. A still finer, flat brush for delicate blending is made of ox hair. It is good economy to buy the best quality brush —it is much cheaper in the long run. Besides, the cheap brush is physically an awkward instrument. The brushes should be cleaned with soap and water and rinsed thoroughly; especially the sable brushes should be allowed to dry in the original pointed shape.

Turpentine is not an appropriate medium for cleaning brushes since it makes the bristle brittle. The soap saponifies the oil completely, but does not dissolve turpentine or any other resin. (There is, however, a mechanical cleansing process when the resin-moistened brush is washed with soap and water.) Rectified petroleum, or toluol, is the best medium for cleaning a resin- and oil-hardened brush. It dissolves the resin without leaving any residue.

An indispensable instrument is the **palette knife,** of greatest im-

portance for rendering heavy as well as thin textures and glazing applications. The use of the palette knife for painting purposes dates back centuries. At least a half dozen palette knives will be needed. They should be straight. The trowel-shaped, so-called spatula is an inappropriate instrument. The bend in the handle of the spatula does not permit the movement of the fingers to be transmitted in direct gear, so to speak, to the canvas. The straight knife should constitute an "elongation of the finger." However, a spatula might be used conveniently for mixing dry pigments with oil.

For laying the oil, gesso or the semi-absorbent ground, a long and not too flexible knife should be used. One can also use for larger size canvas a regular mason trowel with rounded corners. With the trowel large surfaces can be primed speedily. A certain skill, however, is required to handle the tool properly. Another small and somewhat more flexible knife will be needed for preparation of small canvases. For the underpainting one should use the same type of knife, but the blade can be still more flexible. And, lastly, a few knives of various sizes for the painting will be indispensable. Here, proper degree of flexibility of the blade is imperative. A too rigid knife will not move elastically over the surface of the canvas. On the other hand, a blade which is too flexible will not carry the pigment with sufficient vigor, or mix it with few strokes. The degree of flexibility of the blade cannot be determined in words. It is a matter of experience gained by using the instrument. Before painting, the blade should be perfectly blank

and clean. A continuous cleaning of the palette knife while working will be necessary.

The Scraper

Has a short, pear-formed blade, with slightly upturned edges. It is a good instrument to remove dry pigment from the canvas or to draw (scrape) into the wet pigment. A **sandpaper** (finest grade) may also be used to remove dried color as well as to smooth out undesirable textural roughness. The dry oil film can be properly removed from the surface of the painting with the finest **steel wool** or with **cuttle bone.** (See page 70.) **The palette** should be of large size and have the light brown color of wood. A white palette, as sometimes recommended, seems, in the author's experience, to exert a disturbing influence on the eyes. It looks quite dramatic to balance one's palette on the left arm but it is far more practical to keep it on a table. The author's palette is the top of a table.

CHAPTER VII

UNDERPAINTING

THE importance of this first phase of painting cannot be emphasized enough. "A good ground and a proper underpainting is half the work on a picture" was a proverb of the old masters. The underpainting influences the top stratum to a great extent; it is its backbone. It will make the painting last or initiate its decay. It will give it luminosity or opacity. It will make itself felt through the last coat of paint, the more so as the painting becomes older.

The color generally loses its opacity in time; the lower layers and often the ground become more apparent. Overpainted parts, for example, if not sufficiently erased, will appear through the top layer, as occasionally seen in old paintings (a phenomenon called *pentimento*). The term "the ground grows through," describing this sensation frequently found in Venetian paintings, does not mean that the red ground (often preferred by some older schools and first introduced by the Venetians) actually grew through the pigments, but that the overlaid colors have lost their opacity and allowed the ground to reveal itself.

It takes imagination and knowledge to previsualize the final painting and treat the various processes of underpainting accordingly. There are several kinds of foundations upon which one may build the painting. The simplest is called:

(a) Imprimatura

This consists of one tone glazed over the entire white ground of the canvas in contradistinction to the underpainting, which, according to the composition, will carry a few different colors and will be more or less opaque. The imprimatura performs the task of relieving the eye from the monotony of the white ground—and it unifies the tonality of the painting. Besides it is quite difficult to establish a proper relationship of colors on a white surface. The tonal value of the imprimatura should approximate the middle tones of the painting, a procedure which will greatly facilitate its progress. We shall explain the process and try to establish a few rules and suggestions.

1. A semi-absorbent or oil ground will be equally suitable.
2. The final drawing will be transferred to the canvas, outlined with umber or earth red, using turpentine as a diluent, or india ink if an immediate drying is desired. (India ink is indelible; correction of the drawing is therefore not easily effected.) A thin paper covered with charcoal dust should be used for the transfer of the drawing. One should avoid using carbon paper, since the carbon (aniline) color will "bleed" even through a thick oil pigment.
3. The imprimatura should be so thin as to leave the drawing on the white ground of the canvas discernible. It should act as a glaze, quite transparent, revealing the white ground underneath, or as a scumble (semi-opaque application). One should avoid laying the warm colored imprimatura opaquely. Loss of luminosity might result. This precaution can be only dis-

pensed with when later heavy application of white is contemplated or when a ground of very great luminosity is provided. (It has been the author's experience that vermilion could best produce such an opaque and at the same time highly luminous ground: Vermilion, being an expensive pigment, can be cut with yellow ochre when used for a ground. It will take a good amount of ochre without changing its hue to any marked extent.)

4. The thinnest imprimatura can be obtained by covering the ground with color and scraping it while wet with the palette knife. The color can also be wiped off with a rag leaving the thinnest veil.
5. For a warm color range, use a combination of: ochre, Mars colors, cadmiums, Venetian red, umber, or burnt sienna which due to its transparency is most suitable for glazing without admixture of other colors. A small addition of white lead will cut the intensity of the color, if needed. Neutral transparent greys and greens can be obtained from chrome oxide green transparent and light red or burnt sienna, also ultramarine and burnt sienna and related colors.
6. As a diluent for the oil colors needed for the imprimatura, mastic or damar varnish (usually 1:5 in turpentine) should be used. Tempera colors will also be most suitable for imprimatura but for tempera use semi-absorbent ground.
7. One can paint on the wet or tacky imprimatura immediately after its application or on the dry film. A color film produced with a resinous medium will dry rapidly. Before painting upon

the dry ground the surface should be moistened with the painting medium. (Do not use the medium excessively. The oil film should be as thinly and sparingly applied as possible, removing the residue with a rag, and a heavy and sticky medium with the palette knife.) The oil film will permit the brush to slide over the surface of the canvas with greater ease and facility.

8. The imprimatura must not be necessarily of a uniform tone; it can be shaded and varied in tint, also wiped off or left in somewhat stronger accents to aid the composition and general effect of the painting.

(b) Colored or Toned Ground

A silvery green, light grey, or pink ground might cover the white canvas in an opaque layer. Since its color is chiefly composed of white lead, it will impart luminosity to the subsequent painting. For a grey and green range one will employ with the white lead: Prussian blue, also ultramarine or cerulean blue—with ochre or umber or Mars yellow or Mars brown. For a pink ground one will use white lead and Venetian red. Toned grounds were widely employed by the old masters. Since the ground is opaque, the drawing will have to be transferred on top of the dried ground.

(c) The Underpainting

1. Transfer the drawing to the canvas as described in Paragraph No. 2, page 49.
2. The medium used for the underpainting must be lean. It should consist of purified (not thickened) linseed oil, thinned with turpentine (proportion 1:1). 10% mastic or damar varnish might also be added. The less medium used the better.

When underpainting with a palette knife one will hardly need any medium at all to thin the pigments, as even a stiff tube color will be easily distributed with a knife.

3. White lead is the only appropriate white pigment for the underpainting. It is recommended that the white lead powder and oil should be mixed with a palette knife to a stiff but pliable paste. One should try to obtain a coarsely ground pigment, so as to provide "tooth" for the next paint stratum. The finely ground tube color is not the ideal underpainting material. A good amount of white lead should be carried throughout the underpainting.

   When underpainting with self-ground colors, one can proceed as follows: A quantity of white lead should be first ground in oil to a rather loose consistency, whereupon each of the required colors may be added in dry form to this white oil color, and mixed with the palette knife.

4. Underpaint smoothly, and preferably with a palette knife to prevent brush marks which may interfere with the texture of the final painting. If a brush is used for small details or paintings of small dimensions, the stroke should be smoothed with a knife or a sable brush.

5. A light underpainting of vitreous appearance will greatly increase the luminosity of the painting. A dark underpainting will contribute to its opacity. Cool, silvery tones will counteract later yellowing.

6. The light tones may be applied thin or with impasto; the darker tones, if one desires to make the superimposed layer

appear luminous, should be thinly scraped with a palette knife, filling the pores of the canvas and leaving the top grain of the same almost free of pigment, or only slightly covered. Even if one contemplates using a very dark hue in the final painting, as well as black, one should employ a much lighter underpainting.

7. A light tone when applied over a darker appears to be opaque. If for some reason a dark underpainting has to be employed, subsequent painting should carry a pastose application of pigments mixed with white. Generally the hue of the underpainting should approximate the middle tones of the final painting. However, when a glazed color is to be executed on the underpainting a much lighter tone of the same will be essential.
8. The color of the underpainting should not be too close to, or identical with, the overpainting; the superimposition of two equal values will render the color opaque.
9. The thickness or thinness of the underpainting might vary according to the textures planned for the subject.
10. One can paint with contrasting colors by superimposing warm on cold nuances, or reverse the process. For instance, if a final cool green or blue is planned, a warm underpainting with ochre, pink, etc., may be used. Or reverse the procedure. Or underpaint with complementary colors—green on red, or blue on orange—or reverse. The variety is endless.
11. One can paint warm tones over warm underpainting thus increasing the warm tonality of a painting. For example, a cadmium red on top of a yellow underpainting will act differently

from cadmium red superimposed on green. Equally, cold hues may be painted over cold colors. Always observe the precaution not to choose identical color ranges.

12. One can underpaint entirely in neutral monotones, kindred to the grisaille or camaïeu of the tempera school painters, but with slight variations which we shall explain. These two principal methods practiced by the old masters were characterized by detailed modeling in the underpainting of the subject. A figure would be painted in all gradations of the same neutral tone and would be quite finished except for the color glazes. A landscape, especially in the light areas, would also be plastically developed in a similar monochrome range, whereupon the underpainting would be "stained" with color. An appearance of staininess is evident in the method thus employed.

The difference in our approach from that of the grisaille school will be that the monotone underpainting will not have depth or volume, the details will be omitted, and modeling almost absent. This absence of details and prearranged modeling will permit a greater freedom and spontaneity for the subsequent painting, and will not result in "coloring" or "tinting" the underpainting.

But in developing a portrait, for instance, where great attention to likeness and consequently a more deliberate approach would be necessary, it might sometimes be advantageous to model the head and flesh parts in monotone. If a likeness has been established in neutral tones, one can then start on the color problem in a more relaxed mood, and avoid the opacity

and dullness resulting from frequent overpaintings in similar flesh tones.

13. The underpainting must dry well before starting on the final painting. A thin underpainting on a lean ground can be painted over in a week if quick-drying pigments were used and under favorable drying conditions. A ½% addition of cobalt siccative to the medium and the oil color will not be deleterious, and will accelerate the drying process considerably. A thicker stratum of pigment will require a longer time to dry. Pressing the fingernail into the painted surface—with reasonable force—will prove whether the pigment has hardened throughout. Should the surface show any indentation, one must permit the underpainting to dry for a longer period.

    The author does not agree with the opinion sometimes voiced that the underpainting should be allowed to dry for a period of many months, since in using the method described here he has not been able to detect any changes such as yellowing, cracking or darkening many years after paintings have been executed.

14. A second underpainting might follow the first. It may be a little darker than the first underpainting, but it will not yet show the depth or the full hues of the final painting. A second underpainting will be essential if one desires to underpaint some parts thickly in brilliant colors. For example: A thick underpainting with any of the cadmium colors—vermilion, ultramarine or colors of similar characteristics—would be entirely unsuitable. The cadmiums do not possess the solid and

lean body desired for underpainting purposes, and if used in thick layers they dry only very slowly. The slow-drying quality applies also to vermilion; and as to ultramarine, it was mentioned before that a thick application of a glazing or semi-transparent color is not advisable. In the case any pigments possessing the above mentioned characteristics are to be applied for a thick underpainting, one will have to build up first a solid underpainting of pigments related in color to the former and well mixed with white. On top of that layer a thin application of pure cadmiums or vermilion, etc., will follow. One can in this way superimpose on a thick pink pigment, for example, a thin layer of vermilion or on a thick yellow color consisting of yellow ochre and white lead, one can apply a cadmium color in a thin fashion, etc.

15. Should the subsequent painting trickle (stay on the canvas in pearl-like drops and little isolated spots) this would indicate an excess of oil in the film of the underpainting. A film rich in oil would make the next stratum adhere poorly and is contrary to the principle of oil painting, namely, to paint fat on lean.

A surface which inclines to trickle should be rubbed off with a slice of raw potato. The residue of starch left by the potato should be wiped off. Also, finest steel wool or sandpaper may be applied to remove excess of oil from the dried surface. Also, rubbing the painting with a piece of cotton moistened with dilute ammonium will serve the purpose. The trickling will be thus avoided, but to improve the adhesion of the next paint layer one will also have to cover the painting with re-

touching varnish. Retouching varnish will soften the top surface of the underlying paint stratum and thus facilitate the incorporation of the following paint film. If painted upon instantly or within a few hours, the varnish will exert considerable siccative action on the next paint layer. (This might often be desirable on small paintings which can be speedily finished; it will, however, be a detriment when executing large paintings.) The retouching varnish clogs the pores of the stratum on which it is applied, and the following painting would dry with more gloss on such a surface. Retouching varnish should be used with great care on a fresh painting and applied with a soft brush. Especially the glazing might be easily dissolved when pressure with the brush is exerted.

NOTES

An additional function of the underpainting is to aid the coloristic ideas of the painter; to create a more interested approach, to stimulate the imagination. For example, because of such optical challenge, a range of blues developed on a reddish underpainting, is far more intensified than if the blue had been developed on a white or a cold tone. Hence painting on such a contrasting underpainting will react differently to the eye. Often, however, the final right tone cannot be definitely previsualized.

If one is in a quandary as to the final color, one should resolve to underpaint in neutral tones, variations of grey hues derived from any one of the blues with umber or ochre, and white, also pink tones and kindred combinations.

CHAPTER VIII

EGG TEMPERA UNDERPAINTING

THE tempera here described contains egg as the emulsifying property. The emulsion can be effected also by glue, gum Arabic, casein and the like. (Such emulsions were used by the old masters exclusively on board support.) The egg, however, is considered the best emulsifying agent, especially when painting on canvas.

The chief advantages of tempera underpainting are realized on rigid panels. On a canvas support the virtues of tempera foundation are not so spectacular. Granted that the less oil the paint stratum contains, the less will be its tendency to darken and yellow, however, in the previously described oil-resin combination the oil content has also been greatly reduced.

A lean tempera cannot be used on canvas, since the pigments would not have the elasticity needed when painting on a flexible canvas. Moreover, the so desirable quick drying of the underlayers can only be achieved with a rather lean medium, and the fatter tempera will need a longer time to dry.

Tempera dries throughout the mass, because the evaporating water content of the emulsion leaves minute openings in the film and permits simultaneous drying inside and out, and when drying it does not form a skin on its surface.

On a panel support one may use a tempera very poor in oil, with-

out the danger of cracking, since the panel is not so much subjected to vibrations or contractions and expansions due to atmospheric conditions. Furthermore, a panel can carry a strong ground, consisting of many layers of gesso, and this ground would be one of the chief contributions toward the preservation of a luminous appearance of the painting, even if many centuries pass after its execution.

Tempera underpainting must not be executed on oil grounds; poor adhesion would result. A semi-absorbent ground containing not more than twenty percent oil is here essential.

Before starting to paint, the ground should be thinly covered with damar varnish 1 to 2 in turpentine. The varnish might be also mixed with some oil color. This would constitute an imprimatura, and the tempera painting would be executed upon the wet or tacky varnish (or imprimatura).

Tempera Emulsion

Used as a diluent and grinding medium for pigments (when painting on canvas) will consist of:

One measure of egg—yolk and white
½ measure of stand oil (or sun-thickened oil)
½ measure of damar varnish (1:2 in turpentine)
About 1 to 1½ measure of water (use the egg shell as a measuring cup)

The egg should first be beaten to a froth, then stand oil mixed with damar varnish added and both ingredients well shaken. Lastly, the amount of water should follow and the compound vigorously shaken to effect the emulsion. This sequence of mixing the media is imperative in order to obtain a well emulsified compound. The

emulsion is perishable due to the decomposition of the egg. It should be kept in clean bottles tightly closed, and in a dark, cool place. A bottle containing a putrified emulsion should never be used again. Ten drops of vinegar to one half pint of the emulsion will keep it fresh for a longer time.

The tempera emulsion will be leaner if its oil content is replaced by varnish; also, an increase of the water content will make the medium more lean. The variety of combinations is endless.

One should remember that the more lean the medium will be, the more it will darken when varnished, or when it receives oil overpaintings. Therefore, one should refrain from using strong, unbroken colors in tempera underpainting, and keep the colors in light, vitreous hues, of a monochrome character.

Tempera Pigments

It is strongly recommended that the pigments be ground before use instead of employing the often ambiguous (and expensive) material in tubes. The tube color must contain preservatives to keep it from drying up, which in turn might easily affect its quality.

A brief mixing of the pigments with the emulsion before starting to paint will suffice. The colors should be of thin consistency, since the emulsion has not the binding power of the oil medium. The pigments should be distributed in thin layers because a pastose application might easily crack. (This precaution is especially important when painting on a canvas support.)

A lean and thin tempera underpainting under favorable drying conditions can be painted upon with oil colors in about two to four

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UNDERPAINTING: KITCHEN STILL LIFE

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days. A fatter tempera will require a longer time to dry. Before using oil colors, the underpainting should receive a thin coat of damar varnish (1:2 in turpentine), in order to secure better adhesion of the next paint stratum.

CHAPTER IX

EXECUTION OF A PAINTING

Painting Media

Sun-thickened linseed oil
Sun-thickened linseed oil diluted with turpentine
Sun-thickened linseed oil and mastic or damar varnish
Sun-thickened linseed oil, mastic varnish and Venice turpentine
Stand oil and turpentine
Stand oil and mastic or damar varnish
Poppy oil
(formulae for all ingredients on pages 93–5.)

It is decidedly advantageous to finish a painting *alla prima*, since painting *alla prima* insures greater permanence, textural beauty and spontaneity of treatment. This does not necessarily mean that the painting has to be executed on a white ground without any preliminary underpainting. *Alla prima* signifies a method of finishing a painting wet in wet, thus aiming from the start at the final effect. Glazings might be eventually added.

However, if one is not satisfied with some parts of the painting, these should be scraped off instead of receiving another correcting coat of paint. A dry paint can be removed with sandpaper. Also, turpentine can be used to wash off the pigment, or a stronger medium such as rectified petroleum or toluol, but great care should be taken in the latter case not to injure or soften the underpainting.

EXECUTION OF A PAINTING

We develop here a few principles and suggestions for the treatment of the painting:

1. Should the underpainting have obliterated the drawing underneath, the outlines should be retrieved before starting to paint. Also, retouching varnish might now be employed to great advantage in order to provide an agreeable painting surface.
2. In addition, moisten with the chosen medium the surface to be painted, before applying the pigments. This will facilitate their adhesion and at the same time reduce the friction between the brush or palette knife and the canvas. The final stratum will also dry with more gloss. The film of the medium should be as thin as possible. It should be rubbed in with the brush or hand and any surplus removed with a palette knife. (See also trickling, pages 56–7.)
3. Vary the surface of the painting by alternating the thickness or thinness of the pigmentation. Neither a uniformly smooth surface nor a uniformly heavy load of textures will produce the beauty of the *matière*. An abundance of heavy-loaded impastos throughout the canvas would defeat their purpose and counteract their activity. A "heavy" brush stroke is only heavy in relation to a smooth surface. The charm of the surface will also suffer if any heterogeneous texture from within interferes with the final paint stratum.

   Use a few varieties of brush and palette knife to enrich the surface.
4. One should remember that the light color, specifically the white, possesses the quality to refract the light directly; it

should, therefore, be applied in a pastose manner. The darker the color becomes, the more it loses its tangible body. Shadows are like veils cast upon the objects. They will be thin and transparent. A thickly laid shadow will appear opaque.

5. Dark tones will have a greater affinity for smooth surfaces. A grainy or rough surface cannot very well produce the depth inherent in the values of the dark color. The following will demonstrate this statement: Take differently surfaced canvases, a coarse one and a canvas where no grain protuberances will be apparent. Use the same underpainting or no underpainting at all, and cover the differently textured canvases with black pigment. The top of the grain of the rougher fabric will catch the light; in fact, it will receive high-lights, possess reflections and cast shadows. Such a surface will, therefore, lose its depth entirely, due to the dispersion of light. Black has no reflecting power at all; it is not a color, but represents rather the absence of colors. On the other hand, the smooth texture will retain all its velvety depth.
6. There is an old quip: "The light in a painting is like the tenor in the opera—the rest is mostly trimming." Plasticity, volume, chiaroscuro (arrangement of light and shadow) depend entirely upon the distribution of light. One would do well to study the magicians of light—Rembrandt, Tintoretto, El Greco—to gain an understanding of the problem. An abundance of light distributed all over the surface of the canvas with equal intensity will counteract and weaken the "tenor"—the illumination. When one correctly follows the principle of

chiaroscuro, light must be used as a focal agency for relevant parts of the painting.

7. As mentioned before, the light should be painted with impasto. However, to vary the texture, at times it might be useful to derive the light from within, from the light underpainting. Instead of loading the canvas with a white pigment, one will scrape the darker, top pigment off (when wet) and reveal the light underpainting. This should be done preferably on small areas and in instances where a strong pigmentation would appear too pasty and heavy.
8. A great number of colors does not necessarily determine the coloristic appearance of a painting. On the contrary, they may, in fact, counteract its chromatic action and ruin its tonality. A strong, high hue will appear much more active in a quieter surrounding.

   One should endeavor to derive more nuances from fewer colors.
9. It is logical to start a painting in a lower key approximating the middle tones, and proceed with the gradual heightening of the lights and deepening of the shadows. The strongest accents will be the last to be applied.
10. While blending the colors on the canvas, one will observe that a heavy pigmentation tends to smear when blending while in a limpid state. It is often well to wait until the pigment gets tacky and starts to set in. In a tacky state, the blending of a heavy pigment with the palette knife or brush, or putting scumbled tones into a semi-liquid surface, can be most advan-

tageously accomplished. The process of blending the heavy paint strata is also greatly ameliorated by the use of a thick painting medium.

11. Should the final painting "sink in" and the colors become dull and flat upon drying, this would indicate one of two causes. Either the underpainting was not entirely dry before it was painted over and the pores underneath accordingly were not closed—in which case the lower paint film absorbs oil from the top layer—or the ground on the canvas might have been too absorbent, thus also rendering the colors of the paint film dull. A coat of retouching varnish upon the underpainting will prevent such an occurrence. However, it is a good policy to wait until the underpainting is dry before starting to paint on it.

One should not keep a freshly finished painting in a dark room, as the white color will unfailingly turn yellow. The painting should be exposed to daylight for at least a year after its completion. If a painting has been stored in darkness, however, it will need a prolonged exposure to strong daylight in order to restore its whites.

NOTE

Some of the above principles of painting pertain to the classical conventions and traditional schools. They may, of course, be abandoned, modified or varied to serve the intention of the painter. For example, it has been said that the warm colors have a tendency to advance and the cold to recede. It would, therefore, be logical in a landscape, for instance, to use the strong, local colors in the

foreground and have them gradually fade into a cold, bluish mist. However, should one desire to invest a distant subject far beyond the boundaries of the foreground with a dramatic significance, a reverse process in color application might take place. The local color will be in the distance and the less active hues in the foreground. Similarly, one can on occasion bend, twist and condition all the laws of anatomy or perspective; but such an attempt would result in a merely futile distortion if not guided by an understanding of all the problems involved.

Any exemptions to the rules are only justified and can only succeed when based upon a thorough knowledge of the principles of painting which govern these rules.

It must also be remembered that the textural finish, per se, will not create the masterpiece, but every masterpiece will be found to possess the intrinsic beauty of its painting *matière.*

CHAPTER X

GLAZING

THE glaze is a transparent film of color. It contributes to the translucent quality of the surface and enhances its tonality and depth. Some colors have a natural transparence; they will still be transparent, even if applied in thicker layers. But also a semi-opaque or opaque color may be utilized as a glaze if its film is sufficiently thin to make it appear transparent. A very thin film can be obtained with the palette knife on a smooth surface. It can also be rubbed in with the hand. The pigment becomes more transparent the more it is diluted with the medium. Even a normally dense color may thus be rendered transparent; however, as repeatedly stated, an excessive use of the medium should be avoided.

The glazings are not apt to darken when executed on a lighter underpainting; also, their thinness obviates darkening or yellowing. Sometimes one will influence a dark color with a lighter glaze, but in practice such a procedure is not often used. As a rule the underlying color is lighter, and the glaze is darker. Some amount of white lead carried with the color will solidify the glaze. Too much white, however, would deprive the glaze of its transparency.

The typical glazing colors are chrome oxide green transparent, Alizarin crimson, gold ochre, raw sienna and perhaps, in lesser degree, ultramarine and semi-transparent colors: zinc yellow, ultramarine yellow, burnt sienna and the lighter hues of the Mars

colors, manganese blue, cobalt and Prussian blue. However, the transparence of Prussian blue is counteracted by its strong tingeing quality. The semi-opaque pigments are: Zinc white, cerulean blue, cadmium red. The rest of the palette varies from semi-opaque to opaque.

The glazing can be executed upon:

(*a*) the underpainting

(*b*) the finished painting

(*a*) If the underpainting asserts itself through the top paint layer we will speak of a glaze. (In contrast, we have the scumble which is a semi-opaque application, and also entirely opaque paint layers.)

(*b*) A glaze can be executed on top of a finished painting to intensify its brilliance or to modify its hues.

The painting will be sufficiently dry for the application of the glaze when pressure of the fingernail on the paint stratum (using reasonable force) does not leave a mark. A glaze should however incorporate with the painting, and early application is therefore indicated.

Such glazing can be applied on a smooth as well as on a richly textured surface. The surface of the painting will be moistened with the medium and the tone chosen painted in with the brush or rubbed in on small surfaces with the hand. One can thus increase the brilliance of a passage, dim its activity, or change its tonality.

A resinous painting medium should be used for glazing although some quarters reject it. The medium will consist of sun-thickened oil combined with mastic or damar varnish and Venice turpentine;

also stand oil in combination with a resinous varnish. Linseed oil does not bring out the colors as well as a resinous medium, and in time it darkens and yellows unpleasantly, especially if not compounded with a sufficient quantity of dry pigment. In glazings this is mostly the case. The glazing of the old masters was executed in a resin-oil medium.

The objections that a removal of the varnish at some future time might destroy the tender glazing, is to a great extent true. A resinous medium can be softened with strong solvents such as alcohol, even if centuries have passed since its application, but the oil content of the medium, especially the heavy, thickened linseed oil, will greatly obviate that danger.

Restorers who have had occasion to clean early Flemish panels, all testify to an extreme toughness of the glazings. "Only a sandpaper would remove such glazings" is a statement often heard. This would indicate that the medium of those masters consisted of a fossil resin compounded with a boiled oil.

Glazing on a glossy oil film might prove to be quite a problem. The hardened oil of such a surface will have to be removed preferably with finest steel wool. (Steel wool penetrates better into the crevices than sandpaper.) Also, cuttle bone can be used for the same purpose (cuttle bone is the calcified shell of the cuttlefish used extensively by the old masters as an abrasive). As mentioned before, rubbing the surface with a slice of potato will also facilitate the execution of the glaze. However a treatment with steel wool or cuttle bone will remove the skin and create a "tooth" and insure a better adhesion of the glazing application. One must use the

abrasives in parallel strokes and crosswise. Next, the surface will be covered with retouching varnish and shortly hereafter the resinous medium will be rubbed into the painting with the palm of the hand. The surface thus treated will be ready to receive the color glaze.

CHAPTER XI

DIRECTIONS FOR VARNISHING AND CLEANING, AND NOTES ON CAUSES OF CRACKING

Varnishing

Mastic or damar varnish should be used for the final picture varnish. The so often repeated phrase that a painting should be varnished "a year after it has been accomplished" is an inaccurate generalization. The time when a painting should be varnished depends entirely upon the nature of the varnish and the manner in which the painting was executed. For instance, a mastic or damar varnish (1:2 parts of turpentine) will yield a comparatively hard surface and a painting not sufficiently dry might crack when covered with it due to the difference in tension between its paint and varnish strata. Waiting six to twelve months before applying such a varnish is justified, (depending on the thickness of the paint stratum). Copal or amber varnish, however, would yield an extremely hard finish and at least a few years should pass before application. On the other hand, a varnish containing about twenty-five percent of the soft resin will act differently, and early applications are in the latter case possible (three to six months). An addition of stand oil renders the varnish still more elastic. Our retouching varnish can be applied, for example, on the intermediate paint layers even before they have had a chance to dry well, without deleterious result. Here we deal with a varnish of an extremely light, thin body.

DIRECTIONS FOR VARNISHING AND CLEANING

A painting which has received abundant glazing must be varnished with great care, especially when the glazings were executed with a resinous medium. The longer one delays the varnishing of such a painting, the better. A glaze which has been incorporated with the underlying pigment (and not with the varnish) is not so easily destroyed, unless a forceful cleaning with strong solvents is employed.

A varnish compounded with the best spirit of turpentine will dry superficially in a very short time; that means, as soon as the turpentine evaporates, leaving the resin as a protective film on the surface. The mastic or damar varnish becomes very sticky within a few minutes when applied on a painting and its even distribution is difficult, especially on smooth surfaces. The addition of stand oil facilitates its even distribution, delays the drying, and makes the varnish more elastic.

The painting should be thoroughly cleaned and dust-free before the varnishing and should then dry in a dust-free room. The surface to be varnished must also be absolutely free from any moisture and therefore a short exposure of the painting to sunlight or any source of mild heat before varnishing, is recommended. One should not varnish a painting on a rainy or foggy day in order to avoid "bloom." "Bloom" is a bluish veil, due to moisture arrested underneath the varnish. It is especially noticeable on smooth and dark surfaces, and ruins their depth and clearness. It is quite a problem to get rid of the "bloom." Only the removal of the old varnish and revarnishing can remedy it radically.

It is advisable to varnish a painting with the thinnest film and to

avoid making it appear like a mirror. The varnish constitutes an indispensable protection against dirt and the physical and chemical attacks of the atmosphere. If delayed too long, the dirt might incorporate with the paint and its removal prove to be impossible.

During the time the painting cannot yet receive the final varnish, the light retouching varnish will be very serviceable. Should a painting not accept the varnish readily (varnish might also trickle, especially on glazed surfaces), the painting should be rubbed with a slice of raw potato before its application. When applying retouching varnish on a fresh painting, a soft sable brush must be used since by rubbing hard, the color, particularly the glazings, might easily come off. A painting which has hardened sufficiently should be varnished with a bristle brush, also quick distribution of the varnish with the hand is quite practical. (The author uses the palm of the hand chiefly when varnishing, employing rapid circular motions.)

Cleaning

In discussing the cleaning of a painting, the author refers only to the removal of dirt from a painting and not to a restoration. (A painter should not attempt to restore a canvas if he has not received sufficient specialized training and has not acquired workshop experience.) To clean the painting of superficial dust and dirt, crumbs of bread kneaded like a plastic eraser should be used. (The bread must be soft.) A tougher layer of dirt can be cleaned from a well-dried painting with spirit of turpentine or distilled petroleum. (Rub gently with a piece of cotton.) But both these media are strong resinous solvents and should be applied with care.

Toluol will prove a very powerful solvent, as well as alcohol, used in various strengths, depending on the case. One should never attempt to clean a painting with toluol or alcohol unless it has had a chance to dry for at least half a century and providing that no resinous medium was used for its execution. A wad of cotton can be used for gentle rubbing.

Soap and water as sometimes recommended, is a hazardous cleaning method for a painting. Water alone can do enough damage, sifting through the minute openings of the film, softening the glues in the ground and swelling the fibers of the canvas. On a freshly painted canvas with a still elastic paint film, water might perhaps be harmless; but on an older painting, the dry paint stratum cannot follow the movements of contraction and extension of the canvas and cracking and scaling will most likely result. A wet canvas expands to a considerable extent and shrinks when drying. Soap, on the other hand, cannot be entirely removed from the surface, although a mild, neutral soap might not necessarily be a poison for the painting. In general, beware of all chemical solvents; their removal from the canvas is in most cases incomplete.

The removal of varnish from a contemporary painting is no problem at all. Mastic or damar varnishes remove themselves from a picture after a certain period. Gentle rubbing of the surface with the fingers will reduce them to dust. The problem of varnish removal arises when a hard varnish like copal, amber or any other oil varnish was employed, as often happens in the older masters' paintings.

As previously mentioned, oil painting and especially the whites,

will turn yellow when kept in a dark place, and moisture will aggravate that condition. A picture which has suffered due to the above reasons can be bleached again, no matter how old it is, by exposing it to strong daylight for a period of months. A very mild sunlight will bleach a painting in a considerably shorter period. One should be extremely careful however not to "overheat" the canvas (or board).

Protuberances caused by objects pressed against the back of the canvas may be restored by slightly moistening the particular spot on the reverse side of the canvas with water. In extreme cases, where the above described procedure would be of no avail, a moist blotting paper may be put on the back of the canvas, well stretched on a table, for instance, and weighted down for a period of a day or two. Such a precaution should be taken in any case when one is dealing with an older canvas, in order to avoid cracking.

Impressions of the inner-stretcher edge on the canvas are very difficult to get rid of. On a fresh painting, moistening of the crease on the reverse side of the canvas helps in most cases. On older paintings, only relining will remedy it.

All the recipes sometimes recommended to protect the reverse side of the canvas are of not much avail and sometimes even quite harmful. The best protection against mechanical damages is a strong cardboard affixed to the stretcher. A small opening should be left in the center of the cardboard to permit free air circulation. The only way to protect the back of a canvas against moisture would be to have it relined without waiting for a damage which would force one to do so.

DIRECTIONS FOR VARNISHING AND CLEANING

To reline a canvas means to back the old canvas with a new one. The best material for that purpose is a high grade commercially prepared painters' linen (the same as used for painting). To cement the two canvases together white lead oil color is often used, mixed with damar varnish and Venice turpentine. However the canvas cemented in this fashion cannot be easily separated again, should such an emergency arise. It seems, therefore, that a binding medium composed chiefly of wax (a process which has been newly perfected), is more practical, since it permits the removal of the new support. But relining should be done only by an experienced specialist. This is a task which the painter should not try to undertake by gathering his knowledge from written directions.

NOTES ON CAUSES OF CRACKING

Painting executed on a ground or on an underpainting not sufficiently dry.

Too much glue in the gesso ground, or size, or the ground too thickly applied.

Painting on an absolutely non-absorbent ground.

Too thin canvas in relation to the load of pigment carried.

Failure to take into consideration differences in the drying time of the superimposed layers of paint.

An application of lean on top of fat pigment.

Canvas exposed to strong sunlight or artificial heat.

Painting executed on a toothless canvas.

Pigments ground too finely have a tendency to crack.

Some pigments, like umber, Alizarin crimson, burnt sienna, Prus-

sian blue, may crack when painted on a white or very light underpainting. (However, this happens rarely. One might observe such an occurrence on the dress of Van Gogh's "L'Arlésienne" in the Museum of Modern Art. The dress painted with pure Prussian blue on a white ground cracked completely, which does not contribute to the beauty of the painting.)

Zinc white inclines to crack, especially when used in underpaintings. Bitumen will always crack.

Keying off the stretchers with force might easily crack the ground as well as the painted surface.

Excessive use of siccative.

Premature varnishing.

Rolling the canvas the wrong way, namely, with the painted surface inside.

CHAPTER XII

NOTES ON VARIOUS IMPRACTICAL, DUBIOUS OR DELETERIOUS MATERIALS TO BE AVOIDED

(a) The Canvas

Linen mixed with cotton. Burlap. Jute. Linen manufactured of a thread treated with fish-oil (to increase its strength). Such a linen can easily be recognized; it turns very dark when wet. There is no objection to cotton canvas for small-size paintings; however, the grain of the cotton canvas will be mostly too regular and monotonous. Canvas woven too loosely. In this case, too much ground will be needed to fill the pores of the fabric and the ground will crack.

(b) The Glues

Fish glues, glues manufactured from cartilage, all glues sold in liquid form and most of the pulverized material. Synthetic glues.

(c) Oils

Poppy oil is apt to turn rancid when left in open bottles. Raw, unpurified linseed oil and oil obtained by hot pressing methods or extracted by means of chemicals should not be used. Fresh linseed oil contains too much of watery and solid substance and free acid. The cheaper sorts of linseed oil will often be adulterated with inferior oils in addition to other shortcomings they may possess. A darkish, brown color often indicates the presence of an adulterant (such as fish-oil, etc.). An old oil becomes viscous if exposed

for too long a period to oxidation and will develop free acid.

An inferior sort of turpentine becomes viscous through access of air. Copaiva balsam, sometimes used as a painting medium, is harmful. Linseed oil varnish, commonly known as open-kettle boiled linseed oil, as sold today is mostly of poor quality. Usually a small amount of linseed oil is boiled with an excessive quantity of salt of manganese and then dumped into inferior raw linseed oil.

There are, besides, a goodly number of various media and emulsions named after their inventors or manufacturers. The manufacturers' descriptions are usually cryptic as to their composition—they had better be left alone. Discoveries and "rediscoveries" made from time to time, and often acclaimed by authorities, usually prove to be at the best useless, often harmful.

(d) Varnishes

All varnishes compounded with oils, such as copal and amber, dissolved in hot linseed oil, should be rejected as varnishing media. (They might be used as addition to the painting medium.) The hard resins in combination with linseed oil produce a film of an extreme toughness and elasticity. They are almost impervious to attacks from the atmosphere; but they darken considerably and their removal is almost impossible without damaging the painting. When properly thinned with turpentine, the hard resins will render excellent results. Practically all the "copal" and "amber" varnishes as sold today are cheap substitutes.

Varnishes with an alcohol base are unsuitable and should be avoided.

All siccatives containing lead, manganese, etc., should be rejected.

(e) Pigments

Permanent white or titanium white ("titanium white" is never the pure titanium dioxide) is comparatively a new pigment, mostly a combination of zinc sulphide, titanium dioxide and barium sulphate, and is said to be absolutely permanent. Sulphur-polluted air does not affect it. It is non-poisonous, absorbs almost twice as much oil as white lead and its drying and covering capacity is good. It renders colder tones than the white lead. The use of permanent white is entirely a matter of taste; the author could not get accustomed to it.

One should avoid all the lakes, natural or synthetic (aniline), with the exception of Alizarin crimson, because they are more or less fugitive.

Bitumen, cassel brown, Van Dyke brown (hydrocarbon) never hardens if used in the underpainting, it cracks unavoidably, and often deteriorates also as a glaze. The major part of the work of Whistler and a great many of his contemporaries and predecessors has been ruined by the use of bitumen.

Other dubious pigments are chromium yellow; chrome green; sap green; Vert Veronese, also known as emerald green; malachite green (copper arsenite); carmine (extract of cochineal); Indian yellow, unless a genuine pigment, which is today almost unobtainable; the artificial compound is an analine product.

Raw sienna and gold ochre (both beautiful, rich colors) are of

slight tingeing power and excessively oil absorbent. Their use is limited. One can easily find a substitute in some of the Mars colors.

Two oft-mentioned inert earth colors are the raw and burnt green earth. They are lifeless, dull and useless pigments of no covering or tingeing power. (That is, when ground in oil. The old masters used them in tempera applications.)

All blacks but ivory black or Mars black should be avoided.

Only a few colors of the more known varieties have been mentioned here. The number of useless pigments manufactured today is enormous.

NOTES ON PIGMENTS

Generally the price of the oil colors determines their quality, but frequently this is not the fact. The expensive colors like cobalt, cerulean blue (the latter can be easily imitated by using chromoxide green, transparent ultramarine blue and white), the cadmium sulphides, or vermilion, cannot be sold "cheaply" if they are genuine. However, sometimes the genuine product is cut with fillers and extenders and also sold for a steep price. The "best" sorts of cadmium yellow were found to contain a considerable amount of barium chromate. The less expensive "cadmiums," for instance, will not be the cadmium sulphide at all but a litophone product or chromium, and will not have the tingeing power of the true cadmium, nor its permanence. And the very cheap sorts will consist mostly of an aniline dye precipitated on barium, etc. Not always, however, should a pigment containing a filler be looked upon as adulterated. Certain pigments such as some very powerful iron oxides,

gain in tonal beauty when mixed with an extender and do not suffer as far as their stability is concerned.

A higher price of the earth or Mars colors, for instance, is hardly justified, as all of these pigments have almost identical products as their base, regardless of the label they carry. To continue with the list of the cheaper pigments, white lead, in spite of its low price, is sometimes extended with barium. Ultramarine blue: The domestic product is by no means inferior to the highly praised imports (often superior to the latter) and its price is low. The same applies to Alizarin crimson and chrome oxide green. They are all domestic products.

The tube colors are more or less standardized as to their hues. The advantage of buying a dry pigment is that one can obtain many different shades of ochres, for example, or of ultramarine, cadmium reds, Mars colors, etc.

CHAPTER XIII

STATE OF PRESERVATION AND EXECUTION OF PAINTINGS FROM THE COLLECTION OF THE METROPOLITAN MUSEUM IN NEW YORK

Benvenuto di Giovanni: "The Assumption of the Virgin"

Unvarnished tempera. Practically unchanged though somewhat faded colors. After five centuries the pigments did not darken nor yellow. Wood panel. (Plate I)

The same applies to the six-hundred-year-old panel by:

Taddeo Gaddi: "Madonna with Child Enthroned with Saints" (Plate I)

Lucas Cranach: "The Judgment of Paris"

Oil tempera on wood panel. Yellowing or darkening completely absent. The resin-oil glazings might have faded a little. On the flesh parts and the sky, heavily underpainted with tempera, the pigment appears cracked, with a tendency to scale. This can be ascribed to a hard and lean tempera pigment. The dark parts on the background were painted in thickened oil and no cracks are evident throughout those areas. The panel is four centuries old. (Plate IV)

Domenico Ghirlandajo: "A Lady of the Sassetti Family"

Figure: Tempera painting in stipple technique with faint oil-resin glazes. Although four and a half centuries old, the panel is possibly lighter in appearance than at the time it was executed. The painter followed here the often applied rule of the

BONVENUTO DI GIOVANNI — THE ASSUMPTION OF THE VIRGIN

Courtesy of the Metropolitan Museum of Art

TADDEO GADDI — MADONNA AND CHILD WITH SAINTS

PLATE I

El Greco — Cardinal Don Fernand Niño de Guevar

Courtesy of the Metropolitan Museum of Art

Domenico Ghirlandaio — A Lady of the Sassetti Family

Francisco Goya
The Infanta Maria Luisa

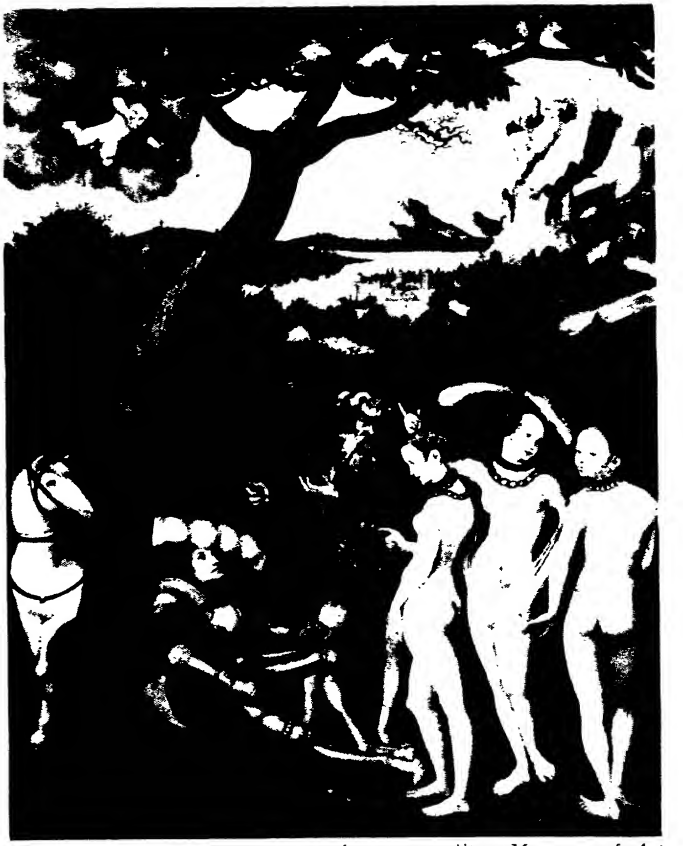
Peter Paul Rubens
The Triumph of Christ Over Sin and Death

Courtesy of the Metropolitan Museum of Art

Pieter Brueghel, the Elder
The Harvesters

PLATE III

EL GRECO — THE NAT



Courtesy of the Metropolitan Museum of Art

LUCAS CRANACH — THE JUDGMENT OF PARIS

PLATE

REMBRANDT VAN RH

LORA

Courtesy of the Metropolitan Museum of Art

FRANS HALS

MALLE BABBE

PLATE

EDWARD MANET

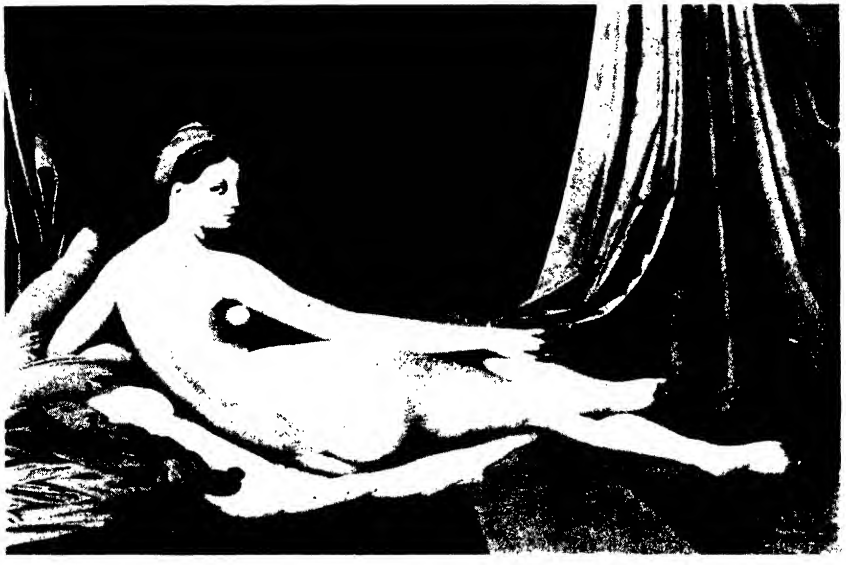
MAJAS ON THE BALCONY

Below:
SIR JOSHUA REYNOLDS

THE HONORABLE HENRY FANE WITH HIS GUARDIANS

Courtesy of the Metropolitan Museum of Art

PLATE VI

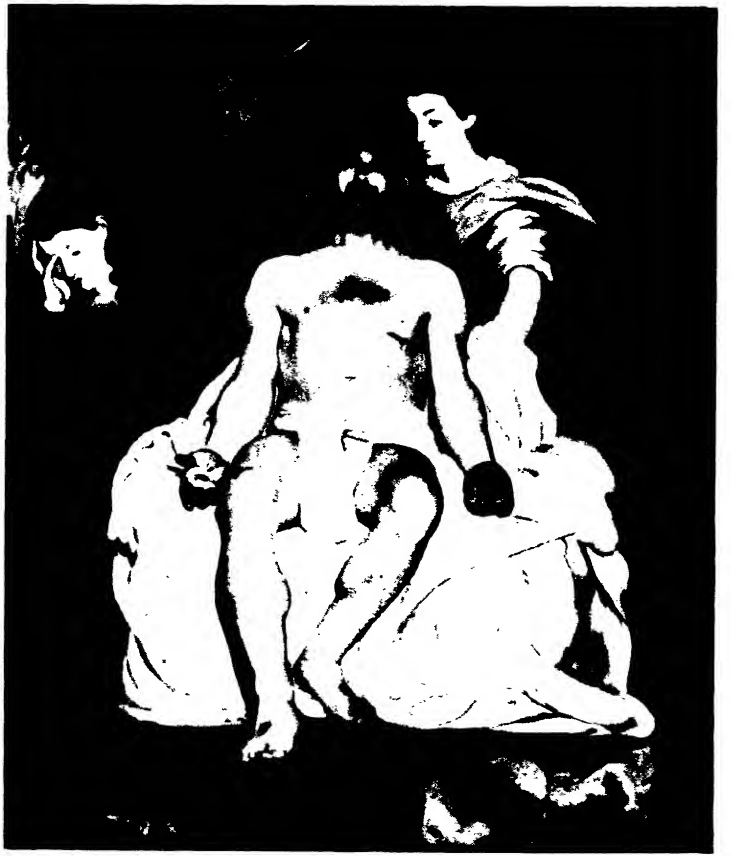


JEAN A. D. INGRES — ODALISQUE EN GRISAILLE

Courtesy of the Metropolitan Museum of Art

A. RENOIR — MME. CHARPENTIER AND HER CHILDREN

PLATE VII



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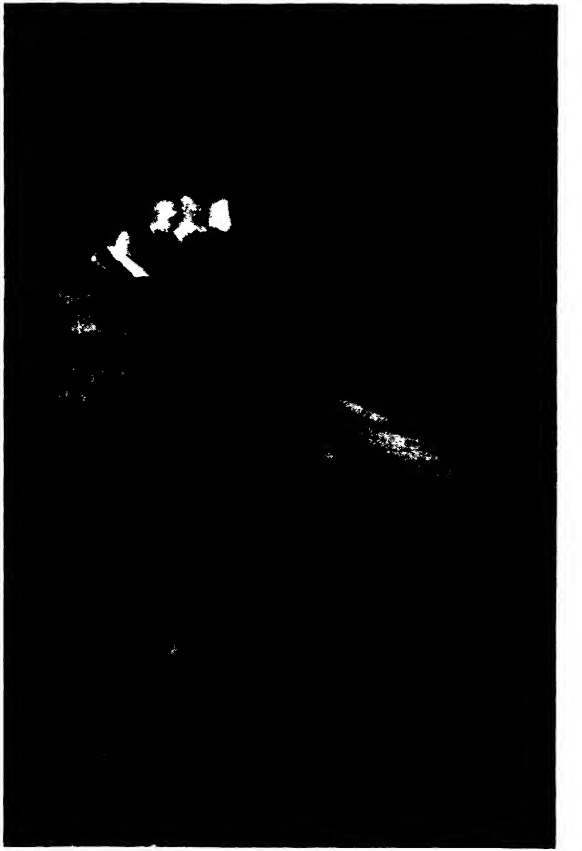


Courtesy of the Metropolitan Museum of Art

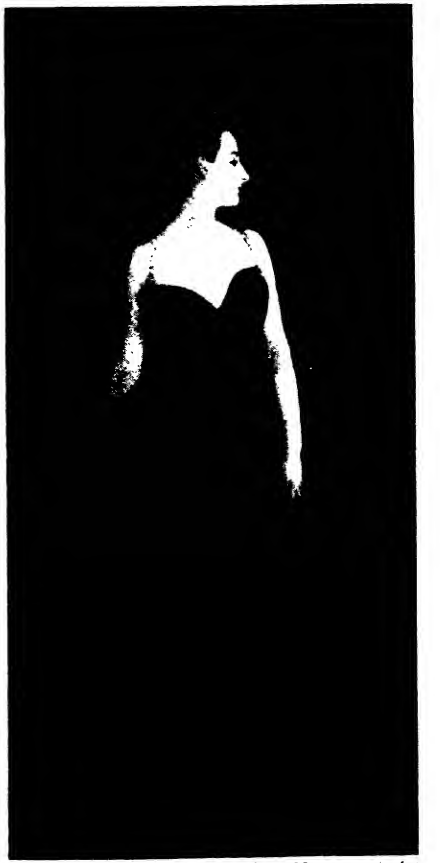
DEAD CHR

AN

GUSTAVE COURBET

ALPHONSE PROMAYET

PLATE



Courtesy of the Metropolitan Museum of Art

EI UARD AN ON AN TH PARROT — OHN S. SARGENT — MADAN X

PLATE IX

ALBERT P. RYDER — TOILERS OF THE SEA

Courtesy of the Metropolitan Museum of Art

JAMES A. McNEILL WHISTLER — CREMORNE GARDENS NO. 2

PLATE X

tempera school, namely, to paint the light parts of the picture exceedingly thin. This permits the strong white ground to assert itself in those parts. (In contrast the oil painter would load the lights with a heavy impasto.) The dark background is painted in heavy, thickened oil color. Its surface is on a higher plane than the light parts of the painting. (Plate II)

Peter Brueghel: "The Harvesters"

The strong, brilliant white ground on wood still imparts, as it did four hundred years ago, an "inner light" pervading the panel. Some loosely painted parts, like the tree trunk, lost their opacity, revealing the light background. Another *pentimento* appears on the cap of the figure in front, the transparent cap revealing the arm of the figure and the tree trunk behind it. The painting has been executed entirely in oil tempera on a light imprimatura. (Plate III)

El Greco: "Cardinal Don Fernando Nino de Guevara"

Three hundred and fifty years could not affect this canvas. It is executed on a light ground, *alla prima*, the face and hands carrying evidently an underpainting in grisaille. The robe is glazed with madder lake also on a grisaille foundation. A slight discoloration in the madders is apparent. The white laces on the tunica were painted into a wet, dark resin-color or thickened oil, with incomparable spontaneity and deftness. (Plate II)

El Greco: "The Nativity"

Canvas carrying a red ground. The whites are applied with

an extreme impasto and are fairly well preserved. The rest of the painting must have darkened to a good extent. The soft yet firm fusion of the pigments indicates the use of thickened (resin?) oil medium. Only a thickly flowing medium would produce the blending of colors as found in El Greco's paintings. (Plate IV)

Rembrandt Van Rhyn: "Flora"

Most sensuously painted heavy textures. Traces of old varnish and dirt accumulation penetrating into the crevices, make the painting appear darker. Their removal is impossible. The shadows, thin semi-transparent glazes, and the dark background, are the only smooth surfaces, accentuating the plastic, pastose treatment of the figure. The colors, especially the white and Naples yellow, were very coarsely ground, which is quite apparent to the eye. The canvas carries probably an underpainting in middle tones.

Rembrandt's medium varied at times, as it mostly happens with painters inclined to experimentation. One restorer of unquestionable authority asserts that no evidence of a resinous medium was found in Rembrandt's paintings, and an equally reliable restorer found the presence of such a medium. Both are probably right. In any event, Rembrandt's medium has been recognized as stand oil. The character of his brush strokes evidences the use of a heavy-bodied oil. There is no indication of Rembrandt's ever having used a tempera underpainting, but on various occasions a grisaille foundation was employed. The general state of preservation of Rembrandt's

paintings is not as good as that of Frans Hals' due to the fact that Rembrandt's underpaintings were often rather dark, covering the ground in opaque layers. Hals' technique was much simpler, the paintings being executed principally *alla prima* on a light, scumbled or glazed undertone. (Plate V)

Frans Hals: "Malle Babbe"

The flesh parts carry an imprimatura in a unifying, warm middle tone, thinly applied on a white ground, the light set in firmly and pastosely, the shadows glazed. The dark dress scumbled on a brown undertone. Grey underpainting for the white collar. A rapid *alla prima* execution. The canvas, three centuries old, is excellently preserved, no trace of darkening or decay evident. Remarkably characteristic in many of Hals' paintings are the cold, crisp whites. There is not a trace of yellowing present and the general appearance of these white applications does not show any marks of deterioration. Some authorities assume that stand oil (sometimes stand oil and yolk of egg) served as the grinding medium for the white pigments. In the author's opinion this is not probable. Hals' white pigment is "short" and crisp. A color ground in stand oil can only be fat and flowing. Pigment ground in a thick oil cannot be stiff, since the thick medium will not absorb enough color substance. This would make the color also far too fat. The use of walnut oil or poppy oil cannot be rejected and is probable, since in the time of Frans Hals, poppy oil was widely used in Holland. The preservation of those remarkable whites must be ascribed simply to an impeccable white lead color,

ground stiffly in a superior quality of linseed oil, or poppy oil. (Plate V)

P. P. Rubens: "Anne of Austria"

Typical appearance of a painting carrying a strong white underlayer in the flesh parts only. The cracks covering those areas end right where the dark background starts. This can be ascribed to a brittle and thick underpainting of those areas. Rubens' medium was provenly a resin-oil compound, consisting of sun-thickened oil, Venice turpentine and mastic. No yellowing or darkening present, except in the black parts applied on a dark underpainting.

P. P. Rubens: "The Triumph of Christ over Sin and Death"

Excellent example of an abbreviated sketching technique. The white ground of the wood panel is covered with a streaky, warm-toned imprimatura which is visible and remains uncovered on many parts of the painting, greatly stimulating its general effect. Liquidly painted with a resinous medium, it has remained absolutely unchanged since the time of its execution. (Plate III)

Joshua Reynolds: "Portrait of the Hon. Henry Fane and His Guardians"

The painting carries a full assortment of cracks and various maladies resulting from use of faulty materials and an unstable technique. Cracks due to a smooth and weak support, use of bitumen, difference in drying time of the various layers of pigment; pigment separations and yellowing caused by an unsuitable medium. Muddy appearance of colors and consider-

able darkening must also be ascribed to a poor medium and unstable colors (lakes). (Plate VI)

J. A. D. Ingres: "Odalisque en Grisaille" (Unfinished)

On a warm yellowish ground the underpainting is developed in meticulously finished monotones in oil colors and was meant to receive a "chromatic stain." A perfect example of a traditional underpainting in monotones. (Plate VII)

Francesco José Goya: "The Majas on the Balcony"

The painting mellowed and acquired jewel-like quality but did not darken to any objectionable extent. The general appearance of the execution points to an underpainting in halftones. The middle tone foundation is clearly discernible in the flesh and in the dress parts. The shadow areas are thin and scumbled, in contrast to the pastose treatment of the light surfaces. The shawls, fringes and laces, also the flower pattern on the dresses of the women, are boldly and broadly executed with a palette knife. (Plate VI)

Francesco José Goya: "Infanta Maria Luisa"

Painting executed on canvas carrying an orange-colored ground, tying up the tonality and prevailing throughout the entire figure. In many places the imprimatura remains uncovered, serving for the shadows and transition tones, and darker shadows are glazed upon it. All other nuances are liquidly scumbled upon the warm undertone. The white pigment remains the only opaque application. The painting is excellently preserved. (Plate III)

Gustave Courbet: "Alphonse Promayet"

An example of consequences resulting from painting on a dark ground without the precaution to provide for the "inner light." Also the medium and the pigments employed must have been inferior. The canvas, but seventy years old, has blackened to the point of invisibility—and it must have been in that state for decades. (Plate VIII) The same applies to:

Eugène Delacroix: "Abduction of Rebecca"

Edouard Manet: "Dead Christ with Angels"

Heavy cracks running through the figure of Christ and also the lower part of the draperies, both painted with an extremely heavy impasto. No cracks on the background and other parts of the canvas which are painted in a thinner fashion. The cause of that damage is due to a misproportion of the weight of the pigments in relation to the weight of the support, the latter being too light to carry the load of the colors. The painting did not darken nor yellow. (Plate VIII)

Edouard Manet: "Woman with a Parrot"

Background ruined through the use of bitumen. Considerable yellowing of the entire painted surface due to a poor medium, or inferior varnish, or impurity of the white pigment—or possibly a combination of those reasons. (Plate IX)

John S. Sargent: "Portrait of Madame X"

Background cracked, also the hair area shows cracks and wrinkles due to the use of bitumen; heavy cracks on the face are caused by frequent overpaintings on a surface not sufficiently dry. Fatty oils used for glazing in the shadow parts result in unpleasantly wrinkled surfaces. (Plate IX)

J. A. McNeill Whistler: "Cremona Gardens"

Illogical use of materials which were faulty in the bargain. A thin, dirty imprimatura (bitumen) on a poorly prepared canvas, inferior thin painting medium (turpentine?) profusely used, no strength in the light parts of the painting. The whole performance faded and sunk in mud. (Plate X)

A. Renoir: "Madame Charpentier and Her Children"

A most brilliant coloristic performance, no darkening or yellowing after fifty years. Various cracks throughout the canvas due chiefly to painting on a not sufficiently hardened or too fat underpainting. The overly smooth support also contributes to cracking of the pigments, especially where their application was thicker. Occasional wrinkles on the surface point to the use of an oil medium, probably poppy oil. (Plate VII)

Albert P. Ryder: "The Toilers of the Sea"

Considerable darkening, dirty tones throughout the entire surface. Deep cracks and discoloration indicating the use of a siccative for a painting medium, and otherwise unsuitable materials. (Plate X)

The examples here represented should serve the art student as a demonstration of various techniques. They are documents of their masters' knowledge or ignorance and evidence of consequences resulting from good or faulty technique. The paintings of the "good" old masters should be our supreme teachers; they are the only source of our wisdom.

COMPILATION OF FORMULAE INTRODUCED IN THIS BOOK

Gesso Ground:
(on canvas)

Water 1 quart
Glue 2 ounces
Whiting 1 pound
Zinc White 1 pound, or titanium dioxide 2 ounces

Half Oil Ground
(on canvas)

Water 1 quart
Glue 2 ounces
Whiting 1 pound
Zinc White 1½ pound
Open kettle boiled linseed oil, or thickened linseed oil up to 8 ounces

Oil Ground
(on canvas)

Gesso ground covered with white lead color

Gesso Ground
(on panel)

1. The same formula as used for the canvas—**or:**
2. Water 1 quart
   Casein 3 ounces
   Whiting 2 pounds
   Titanium dioxide 2 ounces

To make panels non-absorbent isolate the gesso ground with:

1. Glue size
   3 ounces glue to 1 quart water

or:

2. Damar varnish
   1:2 in turpentine

or:

3. Shellac
   1:2 in alcohol plus 5 percent
   castor oil

Imprimatura Medium

Damar or mastic 1 ounce
Turpentine 4 to 5 ounces

Underpainting Medium

Purified linseed oil 1 pint
Turpentine 1 pint
About 10% of mastic or damar
varnish (1:2 in turpentine)

Painting Media

1. Sun-thickened linseed oil
2. Sun-thickened linseed oil, 1 pint; turpentine 4–8 ounces
3. Sun-thickened linseed oil, 1 pint; mastic or damar varnish 4 to 8 ounces. (Suitable for glazing.)
4. Sun-thickened linseed oil, 1 pint; mastic or damar varnish 4 to 8 ounces; Venice turpentine 4 to 8 ounces. (Suitable for glazing.)
5. Stand oil, 1 pint; turpentine, 8 ounces—1 pint
6. Stand oil, 1 pint; mastic or damar varnish, 1 pint. (Suitable for glazing.)
7. Poppy oil

The media, numbers 1, 2, 3, dry rapidly; number 4, moderately well; numbers 5 and 6, still a little slower, and number 7 dries quite slowly. The quickest drier of all the mentioned media will be the sun-thickened oil with mastic or damar varnish. An addition of ½% of siccative will make most of the media dry in 12 to 24 hours.

Grinding Medium for Pigments

Purified cold-pressed linseed oil (or poppy oil)

2% wax oil compound

Unbleached beeswax, ½ ounce, dissolved in turpentine, ½ ounce, add to 25 ounces linseed oil.

Egg Tempera Underpainting

1 measure of egg (yolk and white)
½ measure of stand oil

½ measure damar varnish 1:2 in turpentine
1–1½ measure of water

Light Picture Varnish

Mastic or damar, 1 ounce
Rectified turpentine, 4 ounces
Stand oil, 5% to 10%

Heavy Picture Varnish

Mastic or damar, 1 ounce
Rectified turpentine, 2 ounces
Stand oil, 5% to 10%

Retouching Varnish

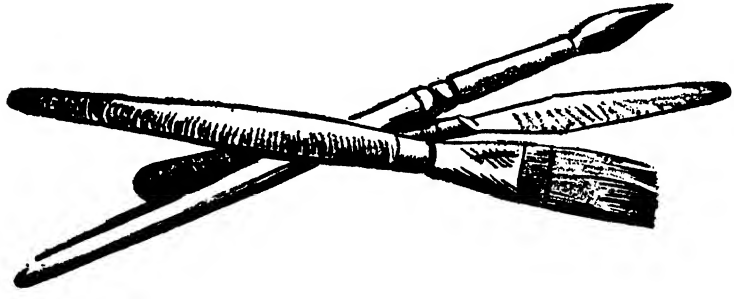
Damar, 1 ounce
Toluol, 1 ounce
Distilled petroleum, 1 ounce
Rectified turpentine, 3 ounces

In order to measure very small proportions of ingredients, such as, for instance, the figure of ½%, we shall employ a simple procedure. Since it is quite difficult for the painter to weigh or measure such small quantities of materials, one should note:

1. The weight of an average studio-size paint tube is about 3 ounces. The weight of white lead, Naples or vermilion will be 5 ounces or more.
2. A studio tube contains about 12 teaspoonfuls of material.

3. A liquid ounce contains 8 teaspoonfuls of liquid.
4. A teaspoonful of liquid contains about 140 drops (use eye dropper for measure).

For example: ½% of siccative to 1 ounce of oil will amount to about 6 drops of the siccative. A three-ounce paint tube will receive (when needed) ½ teaspoonful of aluminum stearite. Since the material is very light and bulky this quantity will amount to about 1%.



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